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VIEWS, NEWS AND INTERVIEWS.

It is proposed to tax gas and electrical energy used for lighting and heating in Italy.

Dr. Bertram Windle has recently made experiments to see whether or not strong magnetism has any effect on the hatching of eggs. He took a powerful magnet and hatched the eggs between its poles—that is to say, in the "magnetic field," where the stress of the luminiferous ether is greatest. The eggs of silkworms were apparently unaffected by the magnetism of "lines of magnetic force" penetrating them, but hens' eggs thus treated were found to produce an unusual number of abnormal chicks. Dr. Windle has also submitted the eggs of trout to an electrical current traversing the water, and found it to arrest their development.

According to recent newspaper reports, considerable platinum is being found in Alaska.

An electric car at Wichita, Kas., was held up by a lone highwayman on July 21. There was but one passenger on the car at the time. He was robbed of $70 in money, and the conductor was forced to give up his gold watch and some small change. The robber ran through an alley and escaped, while at least 50 persons stood and looked at him, but were afraid to interfere.

An encouraging sign of the times is that the number of buildings erected in New York city for the quarter ended June 30, 1895, is officially reported as 1,458 against 764 for the corresponding period last year; estimated cost, $33,001,290, against $18,431,005.

"The Indians of the interior of Alaska," said a traveler to a New York *Sun* reporter, "are as unsophisticated and uncivilized as the natives of the interior of Africa. I saw an Indian lad in Juneau who had been brought from Forty Mile Camp, and it was amusing to watch his interest in the big ships, houses, cattle, electric lights, telephones and phonographs that he saw there. The little incandescent electric lights interested him perhaps more than anything else, and he would have gone broke in buying them if his guardian had not prevented him. He thought that he could take them back to his tribe and make them glow by simply turning the thumbscrew, and he believed that he could sell them like hot cakes on the Yukon. The mysteries of the phonograph seemed to him something supernatural, and they were entirely beyond his powers of understanding."

LITERARY.

The first of Anthony Hope's new series of Zenda stories in *McClure's Magazine* for August, reciting a heroic love passage between the beautiful Princess Osra and brave Stephen the Smith, is most charming. "The girl was young, and the dream was sweet," and the story is in full accord with these attractive conditions. The new jungle story by Kipling is also notable. Only one or two of the previous jungle stories approach it in strength and ingenuity. It tells how Mowgli, under the shrewd direction of Kaa, the rock python, lured the Red Dogs of the Dekkan, whom the jungle feared above all other creatures, to a destruction so complete that not one was left to tell the tale.

Cassier's Magazine for August has the following list of contents: "Electric Elevators," by Joseph Sachs; "The Cost of Steam Power," by Charles E. Emery; "The Cost of Water Power," by Samuel Webber; "Preventing Electrolysis of Buried Metal Pipes," by Isaiah H. Farnham; "Engineering Fallacies," by Henry Morton; "Compressed Air for Engineering Workshops," by C. C. Heggem; "Cableways for Unloading Vessels," by William Hewitt; "Modern Methods of Steam Engineering," by W. H. Booth; "Biographical Sketch of Dr. William Anderson, Director-General of the British Royal Ordinance Factories;" "The Old and the New," by Robert Allison.

THE BOARD OF ELECTRICAL CONTROL OF NEW YORK CITY.

A BRIEF HISTORY OF ITS WORK AND SKETCHES OF THE MEN WHO COMPOSE THE BOARD.

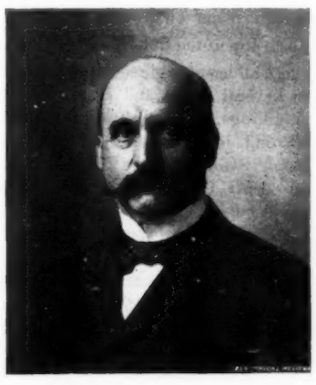
There is not an overhead telephone wire on Broadway, New York city, from the Battery to Central Park. In seven years the Board of Electrical Control has removed 20,612 poles and 27,460 miles of overhead wires, making New York freer of unsightly electrical construction than any other American city of note. Not only has this overhead construction been removed, but subways have been built to take care of all the lines forced underground. Fifth avenue, for example, is a beautifully-lighted thoroughfare, served from subways and illuminated with twin incandescent arc lamps suspended from ornamental standards.

During the 10 years of its existence the Board of Electrical Control has had a tempestuous career. It has been accused of nearly everything from murder to political jobbery; it has had to fight the electrical companies and the newspapers; it has

Mayor William L. Strong, President, ex-officio

Commissioner Jacob Hess.

Commissioner Thos. L. Hamilton.



Commissioner H. S. Kearny, Secretary.

The Board of Electrical Control of New York City.

been obliged to undertake much pioneer construction in underground work, some of which has been blown to smithereens by exploding gas in subway manholes. The board has been consistently "jumped on" most of the time and yet it has accomplished a great work. Whether it was urged on to do this by the biting criticisms of the press and outbursts of public sentiment or whether the cause was the inherent desire of the board to better the condition of New York city's streets is not now under discussion. It seems fitting to here set down something of the good it has done and the progress it has made.

The Board of Electrical Control of New York city was organized in June, 1885, under a State law enacted for the purpose. The first incumbents of the office were Jacob Hess, Theodore Moss and Charles E. Loew. Upon the death of Mr. Loew, ex-Governor R. P. Flower became a member of the board, and he, in turn, was succeeded upon his resignation by his private secretary, Mr. Daniel L. Gibbens. Mr. Gibbens suddenly died after having served on the board about two years, and was succeeded by Walton Storm. The law relating to the Board of Electrical Control was changed, investing the power of appointment solely in the Mayor of New York, and in November, 1894, Mayor Gilroy reappointed Mr. Hess, and in place of Messrs. Moss and Storm appointed Col. Henry S. Kearny who had been engineer of the board for several years, and Mr. Amos J. Cummings, the well-known journalist and ex-member of Congress. Mayor Strong, a few weeks ago, removed Mr. Cummings, appointing in his place Mr. Thomas L. Hamilton.

The board now consists of Mayor W. L. Strong, president *ex-officio*; Henry S. Kearny, secretary; Jacob Hess and Thomas L. Hamilton. Mr. Hess is the only member who has been a commissioner since the board was organized. The terms of the present commissioners will expire in November, 1897. Dr. Schuyler S. Wheeler, the well-known electrical expert, was the electrician of the board from its organization until Dec. 1, 1894, when he resigned. Mayor William L. Strong, who is president *ex-officio* of the Board, was elected in November, 1894, and assumed his office January 1, 1895. Colonel Strong is Ohio born, has been a resident of this city about 40 years and has amassed a fortune in the mercantile and banking business. He was for a number of years president of the Brush-Swan Electric Light Co., of New England, a company that operated under the Brush patents, and at that time became acquainted with many electrical men. When the Electric Club was organized Colonel Strong became a member and was a subscriber to the bonds of the organization. As Mayor of New York he has won the esteem of every right-minded citizen and is managing the affairs of the city in a non-partisan and business-like manner.

Jacob Hess, who has held his present commissionership for 10 years, is 47 years of age, was born in Germany and came to this country when he was three years old. In 1875 he was a member of the lower house of the legislature. In 1876 he was an alderman-at-large for the city of New York. The following year he was appointed an inspector of public schools, which position he held for two and one-half years. Mr. Hess afterwards resigned the place to take the position of Commissioner of Charities and Correction, which place he filled for six years. On the expiration of his term he was appointed a subway commissioner, which place he still holds. Mr. Hess is diplomatic and popular.

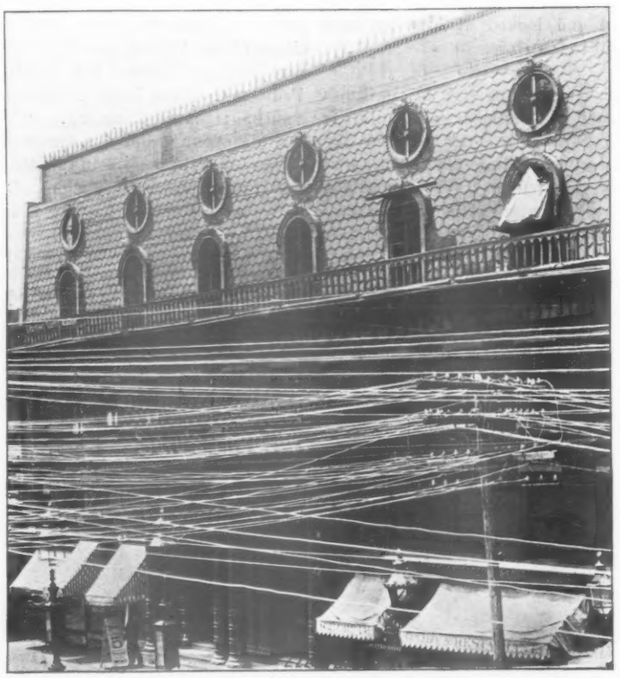


Fig. 1.—Wires on Broadway, New York, in Front of Daly's Theatre, 1888.

Henry S. Kearny, a son of General Stephen Watts Kearny, of Mexican war fame, was appointed a subway commissioner in November, 1894. Previous to that he had been engineer of the board for six or seven years, from the beginning of the construction of the subway work. Mr. Kearny is a civil engineer by profession, having served five years as assistant engineer in the Croton Aqueduct Department and in the Department of Public Works of New York city. He was first appointed to the old Aqueduct Department by Alfred W. Craven, then chief engineer of the Croton Aqueduct. During Mr. Kearny's career he has served as engineer in numerous enterprises in Colorado, where he lived for nine years. He was also elected a State Senator in Colorado and served during the years 1880 to 1884, inclusive. Mr. Kearny is not a politician and his appointment was purely in the line of civil service, he being fitted for the position by reason of his experience as engineer of the board.

Thomas L. Hamilton, the most recently appointed member of the board, was born in the Twentieth Ward of New York city, June 24, 1859, and received his education in the public schools. He is vice-president of the present Republican County Committee and was the Republican candidate for sheriff in 1893. Mr. Hamilton belongs to a large number of clubs and societies and is a member of the successful building firm of John L. Hamilton & Sons, of New York city, who have erected a number of large and handsome buildings, such as the Tenth avenue car stables and the Lakewood Hotel, at Lakewood, N. J.

From the organization of the Board of Electrical Control up to 1889 the work for which the board was organized was repeatedly delayed for various reasons. The electrical companies, who are by law assessed for the commissioners' salaries of $5,000 a year each, obtained many injunctions restraining the board from interfering with the overhead wires. There is no doubt that at this time the overhead construction in New York city was frequently of the most dangerous character, and there were a number of fatal accidents. Meanwhile, the board was building subways which formed reservoirs for gas escaping from the underground mains. Now and then an explosion would rip up the street. A messenger boy was blown skyward in March, 1889, in front of the Fifth Avenue Hotel. The electric lighting companies also objected to the use of iron ducts.

Finally, on April 16, 1889, a gang of men armed with axes began to chop down the poles on Broadway, and the first wire was cut at Fourteenth street and University place. A number of linemen and citizens were hurt in the course of the work by dangling wires and falling poles. The electric lighting companies shut down their service as the work progressed, leaving parts of the city in darkness.

So matters went on for a time, a subway or sewer manhole occasionally blowing up and now and then a fatal accident caused by live wires. On October 11 John Feeks, a Western Union lineman, was shocked to death while at work on a pole at Chambers and Centre streets. Amos J. Cummings, then the *Sun's* star reporter and later a subway commissioner, wrote a vivid signed account of the accident for the *Evening Sun*. The next day the New York papers teemed with sensational articles and pictures describing the accident and the whole city was aroused. Mayor Grant hastily called a meeting of the Board of Electrical Control, heard a report on the accident from Dr. S. S. Wheeler and instructed Commissioner of Public Works Gilroy to immediately remove all imperfectly insulated wires. In spite of injunctions the board went ahead with removing the wires, leaving the city in partial darkness. On the night of October 15, 1889, the city was almost without illumination, 3,000 arc lights being shut off.

This brief sketch of a period in the board's history will serve as an example of its early career. While all these things were happening, new subways were being built and the overhead service was being transferred underground, until to-day we have the conditions with which all New Yorkers are familiar. The accompanying illustrations show graphically and forcibly the difference between the old and the new order of things at an important point on Broadway.

There are now in use in the city for public and commercial lighting, 6,790 arc lamps, 268,000 incandescent lamps and nearly 12,000 telephones, all of which are either wholly or in part served through the subways; and the latest reports clearly indicate that from an electrical as well as a mechanical standpoint the underground system as adopted here is exceedingly successful. The disposition shown during the past few years by the legitimate electrical companies to carry out the wishes of the board, and to comply with its rules and regulations, has been strongly in contrast to the first attitude assumed by them at the initiation of the work of enforcing the subway laws. They had an excuse in those early days, as the success of the subways was not proven. The removal of the overhead wires and poles during 1893 and 1894 was effected without expense to the city. In those two years 2,731 poles and 20,003 miles of wire were removed. The figures of total removals up to date are given at the head of this article.

In a report to Mayor Gilroy on December 22, 1894, Commissioner Kearny, the engineer of the board, summarizes the total construction of subways since the creation of

the board up to the date of the report as follows:

	Miles of trench.	Miles of single duct.
For telephone and telegraph.	80.50	875.53
For Edison.....	188.69	192.10
For electric light	99.12	655.11
For ventilating pipe.....	.....	48.85
	318.31	1,771.59

Into these subways have been drawn, and are now being operated, 39,252¾ miles of wire for telegraph and telephone service, 5,76½ miles of cable for Edison lighting and 1,341 miles of cable for electric light and power service.

The general form of construction originally planned has been, in the main, adhered to. Wrought-iron pipe imbedded in hydraulic cement concrete, with manholes at convenient distances and handholes or boxes about every intermediate building line, with covers flush with the street pavement, for the purpose of distributing electrical service, have been found to be the most successful form of construction and have proved uniformly satisfactory, both for convenience of the users and for desirability. In such streets as have been repaved prior to the construction of subways in them, or where it became necessary to provide additional facilities or make repairs, the relaying of the street pavement has been done by the Department of Public Works, or under its supervision, and always at the expense of the companies owning the subways, and every effort has been made to secure the perfect restoration of the pavement.

The effect of escaping gas from decayed and leaky gas mains has entailed upon the subway companies the necessity of providing a system of blowers at various parts of the city, by which the gas is kept out by a force of air driven under pressure through ventilating pipes running parallel with the subways and having apertures at the manholes by which a resistance of air is offered greater than the pressure of the gas, so as to prevent its entrance.

This system has been found to be generally satisfactory, but the gas companies should be compelled to make every effort to keep their gas where it belongs, namely, in their own gas mains and not impose the expense of ventilating on the subway companies.

The constant inspection by the inspectors of the board and the efforts made to enforce the rules and regulations for overhead wires has resulted, during the past two years, in the making of no less than 5,350 complaints of violations by the different companies and these complaints have generally been promptly attended to.

For seven years *Scribner's Magazine* has had the habit of publishing a mid-Summer fiction number, in which have appeared some of the most notable short stories that have been written by American authors. The present (August) issue is no exception to this remarkably successful record. Any number of the magazine would be notable with an array of contributors which includes Anthony Hope, H. C. Bunner, Hopkinson Smith, Richard Harding Davis, Octave Thanet, Noah Brooks, George Meredith, George I. Putnam and Theodore Roosevelt. The number contains seven short stories, six of them illustrated by artists of the first rank, including W. H. Hyde, Reinhart, C. Y. Turner, Orson Lowell and others.

TELEPHONE NEWS AND COMMENT.

The Missouri & Kansas Telephone Company at St. Joe, Mo., are putting in 10 miles of underground conduit, using the National Conduit Manufacturing Company's system.

The Home Telephone Company have their agents in Omaha soliciting subscribers, asking for a five-year contract at $3 for business and $2 for residence telephones. They promise to start constructing an exchange as soon as they have 1,000 subscribers. They now have over 400 on their list.

The Home Telephone Company, of Sioux City, Iowa, have an exchange of 300 subscribers working, and the Iowa Union have an exchange of 550 subscribers. The business men are compelled to subscribe to both companies to do business, and some of them are not satisfied over this condition of things.

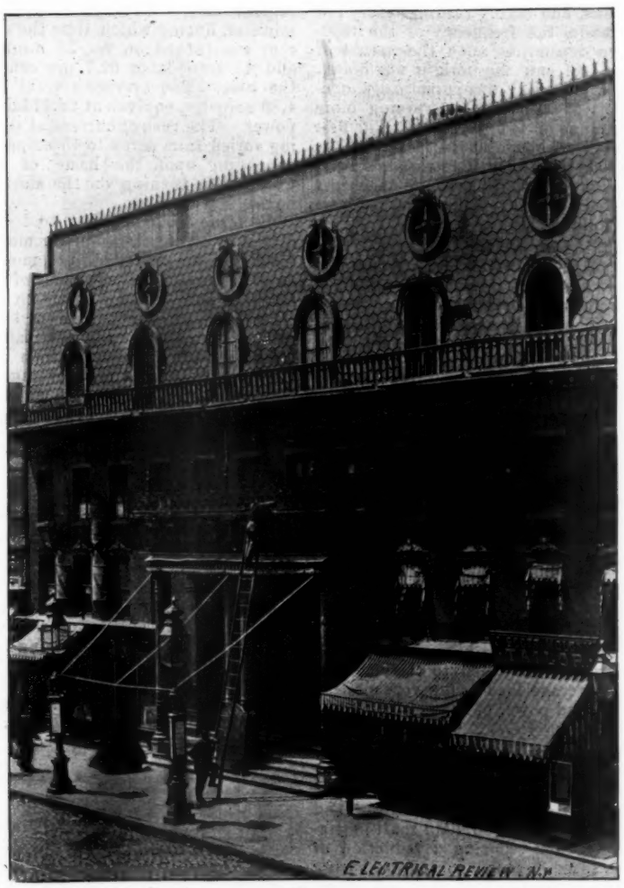


FIG. 2.—AFTER THE REMOVAL OF THE WIRES IN FRONT OF DALY'S THEATRE, 1889.

The output of the American Bell Telephone Company for the month ending July 20 is as follows:

	1895	1894	Increase.
Gross output.....	13,887	6,480	7,407
Returned.....	7,513	5,754	1,759
Net output.....	6,334	676	5,648
Since December 20:			
	1894-5	1893-4	Increase.
Gross output.....	98,896	47,455	51,441
Returned.....	47,121	40,449	6,672
Net output.....	51,775	7,006	44,769
Total outstanding.....	634,283	573,497	60,786

Erie Telegraph and Telephone Company's gross earnings for April and May were $171,596; same months of last year, $169,766. Net earnings were $77,834; same months of last year, $65,515. Net gain of subscribers, 335; last year, 41. Total number of subscribers connected June 1, 16,758.

The Iowa Union Telephone Company have adopted a new rate for their territory, to compete with the Home Telephone Company. At Boone and Oskaloosa, where they have been giving free service, and at Sioux City the rate is now $2 for business houses and $1 for residences, against the Home company's rate of $2.50 and $2.

The Supreme Court of Connecticut on July 24 handed down a decision in the case of Mrs. Caroline L. Bradley, of East Haven, against the Southern New England Telephone Company, finding no error in the trial in the court below. Mrs. Bradley was awarded $800 for the cutting down of two trees on her property by employés of the company and the company appealed.

The New England Telephone and Telegraph Company has declared a quarterly dividend of $1.25 (one and one-quarter per cent) a share, payable August 15. Transfer books close July 31 and reopen August 16. This will make three and one-half per cent so far this year. It paid four per cent in all in 1894 and three and one-half per cent in 1893.

Erie Telegraph and Telephone Company made a net gain of 510 subscribers for the three months ending June 30, the largest increase for the same period in the history of the company. Total number of subscribers July 1, 16,933. The long-distance telephone service has been successfully inaugurated between Galveston, Houston, Austin, Dallas, Sherman and Paris, 510 miles, and intermediate points.

The Cumberland & Pennsylvania Railroad Company is about to rebuild and re-equip its private line telephone system and also that of the Consolidation Mining Company, which is practically owned by the railroad company. General Superintendent L. M. Hamilton, of Cumberland, Md., says he wants the best line equipment and instruments, and what he wants he usually gets.

The Board of Police of New York city last Friday, on the recommendation of Commissioner Andrews adopted the following: "With a view of selecting a police telephone and signal system for the use of this department, the Board invites all persons interested in systems of this kind which have been in successful operation to submit to the Board information in regard thereto."

The Sandusky, Ohio, Telephone Company has closed a contract with the Ohio Harrison International Construction Company, and work has been begun on a $25,000 plant. It is expected that the plant will be in operation October 1, 1895. Three hundred and fifty telephones will be installed at once and additions made as necessary. The construction is under way and a model plant will be the result. All communications should be addressed to Dr. Charles H. Merz, Sandusky, O.

The Mutual Telephone Company, of Elizabeth, N. J., has been enjoined from carrying on a telephone business under the general incorporation act of the State of New Jersey. The New York & New Jersey Telephone Company called attention to the fact that the Mutual company was not properly incorporated and an injunction was granted. A hearing on the injunction will be had in November. In the meantime, it is understood that the Mutual company will be reorganized and incorporated under proper legal requirements. When the injunction was issued a large gang of men was at work for the Mutual company raising poles in Elizabeth. When they were told to knock off work they immediately applied for places with the New York & New Jersey Telephone Company, and were all hired and sent over to Long Island on that company's work.

Under a threat to turn off all the lights in the city of Holyoke at a day's notice, the water power company brought matters to a head in the City Council a day or two ago and succeeded in getting a three-year contract signed, embodying every point in their favor. The contract provided that in case the State orders the wires underground the city shall buy them, and the company can terminate the contract.

ELECTRIC POWER IN FACTORIES AND MILLS.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NIAGARA FALLS, N. Y., JUNE 26, 1895, BY F. B. CROCKER, V. M. BENEDIKT AND A. F. ORMSBEE.

The application of electric power distribution to the operation of factories and mills, including the driving of the various machines and other apparatus, is the latest and one of the most important problems toward which attention is now being directed, the question being one of extreme prominence both from an economical as well as from an engineering standpoint.

In comparing two or more different systems of power distribution, the fundamental basis of comparison is generally that of dollars and cents. This is certainly correct, as far as it goes, but unless a very decided difference be found between the costs of running under the various systems, it may be found that other factors enter—factors which cannot be estimated in dollars and cents, namely, questions of desirability and convenience. Without considering any tests whatever, there are several exceedingly advantageous points in the use of motors in factories which are almost self-evident, such as: 1. Clear and unobstructed passages and head room, the latter facilitating the use of traveling cranes. 2. Ease of shifting the tools from place to place, possibly necessitating the placing of a starting box and the putting up of a little extra wire, as compared with the inconvenience and trouble of setting up and adjusting a line of shafting, hangers, belts, etc. 3. The economy due to the ability to run a single tool without necessarily starting the whole factory or at least a complete section. 4. The running expense is entirely stopped when the tool is shut down. 5. The absence of the drip of oil from overhead shafting. 6. The tools may be placed at any desired points almost regardless of the distance. 7. It is not necessary to arrange the tools parallel as in the mechanical system. 8. A wider range of speed is possible. 9. Less damage caused by a fuse blowing than by a belt slipping off in case of accident or excessive load.

Considerations like the above have great weight in deciding a question such as that under discussion, and there is no doubt whatever that in most cases they rise to such prominence that they warrant a complete change from the old system to the new, even though there is no gain in economy or increased output. In most cases, however, it has been conclusively shown that considerable saving and increase in production is obtained, one test showing a very considerable percentage of increase in the output. The partial, if not the complete, displacement of the old method by the new is only a question of time, and it was the appreciation of this fact that induced the authors to undertake the determination of the power actually required to run the various tools and machines as used in ordinary practice.

The subject is a comparatively new one, not dating back further than about 1890, hence the history of the subject is necessarily short. About five years ago motors were in operation in the works of the Thomson-Houston Company at Lynn, the Crocker-Wheeler Company and the C. & C. Company. Shortly afterward the great German works of the Siemens & Halske Company and the Allgemeine Elektricitäts Gesellshaft began using motors to operate sections of their factories. From that time to the present the use of motors has extended rapidly, until now they have been adopted in many factories all over this country and to a less extent abroad.

In the tests which follow, the power required to drive the tools was obtained by placing an ammeter in the circuit of the motors running the various machines and groups of machines, and taking readings every few seconds, the frequency of the readings depending upon the nature of the tool and the work it was doing. The potential was practically constant at 110 volts, not varying more than one or two per cent. The first tests were made at the factory of the Crocker-Wheeler Electric Company, at Ampere, N. J., and the machines tested and the results obtained were as follows:

1. *Large Boring Machine.*—This machine was driven by a one and one-half horse-power motor, speed 1,200 revolutions per minute, mounted directly on the fame of the tool, the reduction in speed being obtained by the use of gearing. During this test, which lasted three hours, the machine was used for turning down a commutator for a 100 horse-power dynamo. The average current drawn was 8.3 amperes, representing 1.23 horse-power at 110 volts. Before the run was finished, the speed of the tool was increased by changing the combination of gears, and during this time the power required was 1.43 horse-power. When the machine was started from rest, the rush of current was considerable, the average being 17.75 amperes, representing 2.6 horse-power. It will be seen that this motor is well suited to the machine, the average load being very close to the rated power of the motor.

2. *Drill Press.*—A drill press was run by a one horse-power motor, speed 545 revolutions per minute, mounted on a shelf at top of press and belted down to countershaft at bottom, and thence up again to main shaft of machine, thus securing a reduction of the speed. This machine was boring the faces of the cast-steel pole-pieces of a ten horse-power motor, two cutting tools being used. The test lasted four hours and 40 minutes, and during this time the pole-pieces for three motors were bored. The first run covered one hour and ten minutes, and the average current was 2.92 amperes, representing .43 horse-power. It required 15 minutes to replace the completed pole-piece by another one. This second piece required two hours and 32 minutes to finish, and the average amperes was 2.82 or .41 horse-power. This time it required 17 minutes to replace the piece and then the machine ran only 23 minutes until closing time. The current for this short run was 2.81 amperes, representing .41 horse-power. The total length of time the machine was running was four hours and five minutes. Therefore power was supplied to the motor 86 per cent of the time of the test.

3. *Drill Press.*—This machine was similar to the one preceding, but the work was different—namely, drilling half-inch holes in cast-iron bearings. The average current was 2.86 amperes, which represents .42 horse-power.

4. *Drill Press.*—This tool was the same as the other two, and the work consisted in boring the inside of cast-iron bearings. The average in this case was 1.9 amperes or .28 horse-power. It will be noticed that in the case of these three machines a motor of one-half horse-power would be of ample size to do the work.

5. *Punch Press.*—This was a small punch run by a one horse-power motor mounted on the base of the machine and belted to its heavy fly-wheel. The speed of the motor was 700 revolutions per minute. This tool was punching slots in sheet-iron disks for a 10 horse-power armature, there being 28 slots in each disk. The motor was turned off every time a disk was replaced, but it did not come to a dead stop as the inertia of the fly-wheel was so great. Readings were taken every five seconds and the time of turning on and off the current was noted. The test lasted 57 minutes, during which time the current was turned on for 35 minutes and 45 seconds, or 62.7 per cent of the time. The average current was 4.86 amperes, equivalent to .71 horse-power. The rush of current at starting varied from seven to 15 amperes, depending upon the haste of the workman in turning on the starting box.

6. *Gang Drill.* — This tool was driven by a one horse-power motor, 1,000 revolutions per minute, mounted with vertical shaft in frame of the machine and belted directly to the three drill spindles. The material drilled was cast-iron and the sizes of the holes were one-fourth inch and three-eighths inch. The average of the readings taken was 4.75 amperes or .7 horse-power. When the drills were running free the motor took 3.5 amperes. Thus the power required to overcome friction was 74 per cent of the power used while drilling.

7. *Group of Two Machines, One Lathe and One Milling Machine.*—This group was driven by a three horse-power motor, belted to a short line shaft, from which belts ran to the countershafts above the two machines. The average current was 10.04 amperes, the power being 1.48 horse-power. In this test special attention was paid as to which machine happened to be running free, cutting, etc., with the results given in the following table:

Class of Machines and Work.	Amperes.	Horse-power.
Milling Machine Running Free—Lathe at Rest	5.67	.836
Lathe Machine Running Free—Miller at Rest	7.36	1.085
Both running free	10.	1.47
Milling Machine Cutting—Lathe run free	10.33	1.52
Lathe Cutting—Milling Tool running free	14.43	2.12
Both tools cutting	15.4	2.28
Cutting rate increased on the lathe	17.8	2.61

8. *Group of Six Machines, Consisting of One Milling Machine (Small), Two Lathes (10 or 12-inch swing), One Grindstone, One Drill Press and One Small Punch Press.*—The last-named tool was not run at all during the test and the grindstone ran continuously. This group was run by a one horse-power motor, belted to the usual ceiling line shaft. The average current required to drive these machines was 5.86 amperes, representing .86 horse-power. Thus this motor ran at about its most economical load.

9. *Group of Seven Machines, One Planer (Small), One Grindstone, Four Lathes, One Hand Turning Lathe.*—A three horse-power motor was used to drive this group, being belted to a line shaft, the same as the previous groups. The current was 13.36 amperes or 1.97 horse-power. When the entire group was in use 2.65 horse-power were required.

10. *Group of Seven Lathes and One Grindstone Driven by a Three Horse-power Motor.*—The average current was 9.92 amperes and the power required was therefore 1.46 horse-power. The power used by the motor when different numbers of lathes were running is shown by the following table:

Number of Lathes Running.	Amperes.	Horse-power.
One	7.76	1.14
Two	9.16	1.35
Three	10.69	1.58
Four	12.23	1.8

Thus in a group like this, it only takes 63 per cent more power to drive four lathes than it does to run one, the reason being the fact that it probably takes about one horse-power to drive the countershafts.

11. *Group of Two Machines, a Large Punch Press and a Large Planer.*—The motor for running this group was placed on the floor and drove a short line shaft on the ceiling by the usual form of belt. The rated capacity of this motor was seven and one-half horse-power, and its speed was 1,350 revolutions per minute. The punch press did not run during the test. With the planer idle and the motor driving the shafting and belting alone, the current was 15.5 amperes, which represent 2.3 horse power. While the planer was at work the motor required 33.1 amperes or 4.87 horse-power. As the loss from friction in the shafting is nearly constant under the variation of load, the power required to overcome this friction was 47 per cent of the total power used. When the bed of the planer reversed from its slow cutting stroke to the comparatively rapid return stroke, the current increased to 52 amperes, showing an expenditure of 7.6 horse-power for a few seconds. This tool was planing the frame of a 90-kilowatt multipolar dynamo, the material being cast-iron.

12. This group was a very large one, consisting of 20 machines, eight lathes, four milling machines, three planers and shapers, two grindstones, one vertical shaft grinding machine and three small tools. The motor in this case was rated at 10 horse-power at 750 revolutions per minute. A Thomson recording wattmeter was placed in the circuit of this motor for one afternoon. At the end of this time the wattmeter showed a total of 17,854 watt hours used, and as the time was five hours, the average power was 3,571 watts or 4.78 horse-power. The average number of machines running was 13, most of the lathes being in use the greater part of the time. An ammeter was inserted in the circuit of the motor for a few minutes, and it was noted that the work was very steady, the current not varying more than three or four amperes at any time.

13. A group of five machines run by a three horse-power motor was next tested. Of these five machines, one was a lathe with 17-inch swing and eight-foot bed, one was a slotter and the other three were lathes of 12 or 14-inch swing. The average amperes were seven, and the power 1.03 horse-power.

14. The last tool tested at this factory was a large new engine lathe, which had just been set up, of 50-inch swing. This tool was driven by a three horse-power motor mounted on an iron bracket built in the base of the machine. The motion of the motor shaft is transmitted to the tool by gears, thus doing away with all belts. The work done was turning a five and one-half inch steel shaft for a 200-kilowatt dynamo, facing the ends, etc., the cut being very light, as the work was only preliminary. The average current consumption was 11.4 amperes. Hence the average power was 1.68 horse-power.

(To be continued.)

TRACTION CONSOLIDATION IN PHILADELPHIA.

THE PHILADELPHIA, PEOPLE'S AND ELECTRIC TRACTION COMPANIES COMBINED AS THE UNION TRACTION COMPANY—CAPITAL, $30,000,000—THE COMBINATION BRINGS SOME QUEER DEALS TO LIGHT.

A deal was consummated on July 23 by which all the electric traction companies of Philadelphia except one comparatively small company are brought under one control and one management. On July 24 application was made at Harrisburg for the incorporation of the Union Traction Company with a capital of $30,000,000 under the general street railway act of 1889. Accompanying the application was a certificate that 10 per cent of the capital had been deposited by the incorporators in the hands of a treasurer, as required by law. The deposit of $3,000,000 was made at the banking house of Drexel & Company, and the sum was raised, it is understood, by John Lowber Welsh, who will be the president of the new company. The incorporators named in the application are the 11 men who will ultimately be chosen directors of the company. These are John Lowber Welsh, Caleb S. Fox and William H. Shelmardine, of the People's Traction Company; P. A. B. Widener, William L. Elkins, Thomas Dolan, Joseph B. Altemus and James McManes, of the Philadelphia Traction Company, and Jeremiah J. Sullivan, Alfred Smith and Alexander M. Fox, of the Electric Traction Company. The charter cannot be issued until 21 days after the application.

Who the officers of the new corporation will be, beyond the announcement that John Lowber Welsh will be president, is not known. There will be one, if not two, vice-presidents, a treasurer, a secretary and a general superintendent to direct the physical operation of the property. President Widener, of the Philadelphia Traction Company, and President Sullivan, of the Electric Traction Company, will assume no executive functions in the management.

The three traction companies named above control all the street railways of Philadelphia except the Hestonville, Mantua & Fairmount Passenger Railroad Company, which will be acquired later, it is said, by the Union Traction Company. The People's and Electric Traction companies will consolidate and secure control of the Philadelphia Traction Company on the basis of eight per cent dividends, or $4 a share on the par of $50, as paid since November, 1894. The stockholders of all three companies will have the privilege of subscribing to the 600,000 shares of stock of the new corporation in the proportion of their present holdings. This proportion will be nearly 77⅔ per cent.

The financial obligations of the companies forming the Union Traction Company, including rentals paid on leases of the smaller railway companies, bring the annual fixed charges of the company up to $5,336,858, which must be earned out of five-cent fares before any dividends can be paid on the $30,000,000 capital stock.

The Philadelphia *Press* recently called attention to the fact that the amount paid on shares of capital stock and total bonded debt of the traction railway corporations and their subsidiary companies represented an investment in the street car traffic of Philadelphia of nearly $60,000,000. This is equivalent to a capitalization of $120,000 per mile. The addition of $30,000,000 of capital to be subscribed to the new Union Traction

JOHN LOWBER WELSH, PRESIDENT UNION TRACTION COMPANY, PHILADELPHIA.

Company, and the issue of trust certificates at the valuation of $75 a share for People's Traction stock and $85 a share for Electric Traction stock, swells the aggregate to $104,000,000, which represents a total invested capital of $208,000 per mile of street operated with electric railways in Philadelphia. It is understood that it will not be necessary to call in the full amount of the charter capital of the new corporation, and that possibly not more than $10 a share would ever be paid on it.

MR. WELSH'S CAREER.

John Lowber Welsh, who will be the president of the Union Traction Company, has taken a great interest during the last few years in Philadelphia street railway management. He was instrumental in the formation of the People's Traction Company, of which he was made president, an office he still holds. Mr. Welsh is the son of the late John Welsh, who served with great honor as United States Minister at the Court of St. James. Since the death of the latter, John Lowber Welsh has been at the head of the banking and commercial firm. For many years he has been closely identified with the Reading Railroad and its allied coal interests. He has been connected with steam railway financial operations of great magnitude. During the lifetime of the late Anthony J. Drexel he was one of the trusted confidential advisers of that financier. Under the will of the banker he was constituted a co-executor and trustee of his great estate. Mr. Welsh is essentially a home-loving man, is a member of no clubs and has few interests beyond his home, his business and his horses.

A CHANGE OF CHIEF ENGINEERS.

In the course of the investigation of the various traction companies' properties, which preceded the consummation of the deal mentioned above, a number of disclosures surprising in their nature were made. As the ELECTRICAL REVIEW has secured the story, it is substantially as follows:

On July 18 President Edward Peckham, of the Peckham Motor Truck and Wheel Company, was in Philadelphia in relation to the final settlement of an account which his company held against the People's Traction Company. He was closeted with Mr. Welsh, Mr. Fox and another gentleman. In his conversation with Mr. Peckham Mr. Welsh is understood to have asked him if he knew of a suitable engineer to take Mr. McIntire's place. Mr. Peckman is said to have recommended Mr. J. R. Beetem, general manager of the Scranton Traction Company. Mr. Beetem, for the last six years, has been in the service of E. W. Clarke & Company, of Philadelphia, who have been building electric roads in Scranton and elsewhere.

Mr. Beetem was telegraphed for and arrived in Philadelphia on Friday, July 19. It is understood that he was offered Mr. McIntire's position as general manager and chief engineer at a salary of $10,000. He accepted and McIntire was informed that his services were no longer required, the notice to take effect at once.

The legal firm of Carson & Jones, of Philadelphia, who represent the People's Traction Company, are understood to be investigating charges against McIntire of accepting commissions from companies dealing with the Traction company.

When ex-General Manager McIntire was seen by a reporter he claimed that the People's Traction Company had never stipulated that he should work for them exclusively. Before he went to Philadelphia he said that he had been offered salaries by two concerns to act as expert; one of these was an electric company which paid him a salary in order that he might be consulted about electrical matters. The other was a truck company. He said that he did not believe that he did any wrong. "I told Mr. Biebel," he said, "when he recounted the things I was accused of, that if his view of it was that I had no right to work for outside corporations, then I had done wrong. This whole matter will no doubt all come out in a legal way and I prefer to say nothing more about it until that time."

Electrical Equipment of the "North Land."

The Northern Steamship Company owns and operates the two elegant sister ships "Northwest" and "North Land" on the Great Lakes between Buffalo, N. Y., and Cleveland, Detroit, Mackinac Island, Sault Ste. Marie, Duluth and West Superior. Each vessel is 386 feet long, 44 feet beam and 34 feet deep from the spar deck to the keel. Twin screws, driven by engines of 3,500 horse-power each, drive the vessels between Duluth and Buffalo inside of 60 hours. Accommodations are provided for 500 passengers. The electric lighting plants of the ships are very complete, each vessel being provided with twelve hundred 16-candle-power incandescent lamps, and a 100,000 candle-power search-light. These latter were used on the Liberal Arts Building at the World's Fair. Three triple expansion engines furnish power for the dynamos. The wiring system is the same as that used by the United States Navy. The signal lights are of 100 candle-power each and are equipped with automatic alarms which ring a signal and light a lamp in the pilot house when the signal lights have been extinguished by accident.

Some Big Advertising Contracts.

The always interesting *Fourth Estate*, a New York weekly journal devoted to news about newspapers and newspaper men, mentioned in a recent issue that a contract for $2,300 for one page for one year in a western journal had been reported to it as probably the largest contract ever made with a class journal. The ELECTRICAL REVIEW can beat these figures, and there are possibly other journals that can do still better. If so, it would be interesting to have them speak out. The ELECTRICAL REVIEW contracted with the Brush Electric Company, of Cleveland, O., at the time Mr. George W. Stockly was president and Mr. J. Potter was treasurer, for one page for one year, to occupy the inside back cover, at the total cost of $3,380, or $65 per week. This company, under the enterprising management of these gentlemen, it is scarcely necessary to say, was the most successful electric company in the manufacturing field.

Another contract, that for the length of time it covered will be hard to excel, was one made with the Sawyer-Man Electric Company, of New York, Henry C. Davis president. This was for six months for the inside front cover page of the ELECTRICAL REVIEW for $2,600, or $100 per issue. This company reached through this means the enormous daily sale of 15,000 incandescent lamps.

These contracts were filled and paid for promptly, and if any electrical house wishes to make a better record in this line the ELECTRICAL REVIEW stands ready to accommodate it.

A scheme for lighting the Victoria Embankment by electricity will be discussed by the London County Council. The capital cost of the undertaking is estimated at £16,590, and it is proposed for this sum to install the electric light not only throughout the entire length of the promenade, but across Westminster and Waterloo bridges.

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, JULY 31, 1895.

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"WHAT IS THERE IN IT FOR ME?"

The electrical business, including its allied branches, has been for years and is now apparently more than ever afflicted with a certain class of individuals known as "sand-baggers," "double-enders" and "commission men"; that is, men who are employed in positions of technical trust and who prostitute themselves and their profession for a sum of money or its equivalent to a manufacturer whose goods they recommend to, and often purchase for, their employers irrespective of the merits of the goods.

We ought to be able to say that any manufacturer who descends to these methods to effect a sale of his product must necessarily manufacture an inferior article; else his goods would sell on their quality. But this is not always true. The reason is that the commission man has made himself such a power that, allied with the sharp competition which seems natural to the electrical business, he is able to force a reputable manufacturer into paying him a so-called "commission" in order to effect a sale. This "commission" is nothing but a bribe.

And who really pays the commission? Not the manufacturer, but the consumer—the man whose interests the "sand-bagger" is employed to protect. The margin of profit in the majority of electrical goods after the legitimate selling expenses have been deducted is not sufficient to permit the payment of commissions worth the "sand-bagger's" consideration. Therefore the manufacturer adds the amount to the selling price and the consumer foots the bill.

We are thankful to say that there are many firms in the electrical and allied industries who have consistently refused under all circumstances to be forced or cajoled into paying such bribes. There are others who have been weak enough to yield when a serious loss of business apparently threatened them. And again there are firms whose goods could not stand the fire of competition unless their path was "greased." The real culprit is the man who uses the power of his position, the influence which his employer's faith in him has created for him, and who prostitutes the profession of electrical engineering for the sake of money which he does not and cannot legitimately earn. He is not a fit nor a safe man to do business with—even to bribe.

The ELECTRICAL REVIEW intends to do what it can, and that is not a little, to rid the business of these "sand-baggers." We warn them all to take heed in time. We call upon manufacturers to assist us in what we know to be a just cause by refusing to be "held up" for commissions. An effective way of breaking up the practice is to refuse to deal with the "sand-bagger." When he insists on a commission, go straight to his employer and explain the matter. Another way is to forward the facts in the case, with substantial proof, to the ELECTRICAL REVIEW, or any other reputable electrical journal, and trust to the investigation and exposure which will follow.

AMONG OUR EXCHANGES.

Peck's *Export and Purchase Index*, published in New York city, is a well-printed and able publication devoted to the export trade.

A new electrical publication in Chicago appears with several very creditable advertising pages. One of these advertisers writes to the ELECTRICAL REVIEW as follows: "In answer to your favor of July 23 would say that if you wish to give us an advertisement on the same terms as we get the one referred to, we will be glad to give you one also. It is not necessary to state what these terms are, but you can judge for yourselves." This is easily understood. The offer is respectfully declined.

The *Western Electrician* published last week a very commendable story of the Northwestern Electrical Association's convention. We understand, however, that the jack-knife artist who whittled out the portraits of the delegates with his little hatchet has been discharged. This is "fittin' and proper."

We commend the generosity and progressiveness of Mr. H. H. Kohlsaat, proprietor of the Chicago *Times-Herald*, who has offered a prize of $5,000 and a gold medal for the best horseless carriage propelled by electricity or any other mechanical agency, to be determined by public competition.

The insulated wire market is in a very satisfactory state, the demand being in excess of the supply. The recent rise in copper has increased prices on covered wire and most of the large manufacturers are behind in their orders.

We publish in this issue an article on "Secondary Electrolysis," by E. Andreoli, of London. The author claims to have discovered a new phenomenon and we should be glad to have the views of our readers on the subject.

Wall Street and the Electrical Stock Market.

A strong upward swing in prices was inaugurated at the beginning of the week and continued without important interruption up to the close. The granger group and railroad shares are the leaders, establishing materially higher prices. The better feeling was incident to the development of the corn and wheat crop to a point which insures a heavy yield, barring the effect of frost on corn. Commercial reports are, without exception, favorable, while railroad earnings show sharp improvement. One particularly noticeable development in the business world is the upward movement in metal, doubtless in sympathy with that in iron. There is no abatement in the demand for this product, and purchasers are seeking to make contracts for forward delivery at present prices. Pig lead advanced $1 per ton to $70, and lake copper, which is so closely allied to the electrical industry, is now selling at 11½ cents per pound, an appreciation of 2 cents from low. Even at the advance producers are indifferent and are stubbornly refusing to place contracts for distant futures.

There was only a moderate amount of interest in electrical securities. General Electric, as usual, was a leader. The stock had a slight set back on Thursday, and in the subsequent days of the week recovered.

I am told by high authority on General Electric that there is no change in the status of negotiations looking toward a removal of the plants from Schenectady to Buffalo. The municipal authorities in Schenectady will, in all probability, make a grant of land adjacent to the company's plant, which is necessary for extensions contemplated. If this is done the company will not move. Regarding electrical business at the present time, my informant says it is 25 per cent larger than a year ago. Prices are very close. He does not look for any definite decision on the part of the Manhattan company regarding the electrical equipment of its line this year. The first move will be the installation of an experimental plant. The Metropolitan West Side Elevated, of Chicago, which was equipped by General Electric and placed in operation in the Spring, is said to be operating its line very satisfactorily.

The old electrical companies, I am told, are somewhat inclined to view with favor the reorganization of the Siemens-Halske Company of Chicago. They say it is guaranteed that it will be administered on business principles, which will enable them to figure accurately on competitive work. The entrance of Yerkes into the board will probably make some difference with the General Electric Company in the end, on its Chicago street railway contract.

The American District Telegraph Company has declared a dividend of 1 per cent, payable August 6. A dividend of 1 per cent was declared last February. There is a surplus at the present time of over $300,000. The dividend policy of the company is to distribute earnings when the money can be spared; consequently no stated time for dividends has been fixed. The company, I am told, is receiving some very tempting offers for the use of its wires. The Western Union interests in the board represent 10 per cent of the stock. They are naturally averse to allow the company to become in any way a competitor. There is considerable dissatisfaction over this control of policy, in view of the small ownership.

On the Boston Exchange, Bell Telephone while inactive was strong, advancing a point and closing at 197. Erie Telephone lost its gain of last week of 1½, closing at 57½ bid. New England Telephone lost 4 points from high, and recovered, closing at 88. The strength of Westinghouse common continues. It was bid 36¾ and held at 37. The quotation of the preferred was 53¾@54. BAIN.

New York, July 27, 1895.

PERSONAL.

Mr. Charles R. Huntley, general manager of the Buffalo General Electric Company, is riding a bicycle and looking as proud as if he owned a horse.

Mr. R. B. Corey, the well-known arc lamp specialist, returned to New York city on July 23 after a successful five weeks' business trip through the West.

Mr. J. D. Leatherbee, the energetic head of the National Telephone Manufacturing Company, of Boston, was a New York visitor last week. The National company is very busy supplying telephone sets to all parts of the country.

Mr. Chester D. Crandall, of Chicago, manager of the Western Electric Company, paid his many New York friends a pleasant visit last week and honored the ELECTRICAL REVIEW with a call. Mr. Crandall is a former telephone man, but of late has devoted his abilities, which are of a high order, to the manufacturing line in which he has been very successful.

Mr. J. E. Keelyn, of Chicago, president of the Western Telephone Construction Company and president of the Telephone Protective Association, recently organized in Pittsburgh, passed through New York last week *en route* to Boston. Mr. Keelyn stopped at Pittsburgh and Washington on his way East, in both of which cities his company does a large business.

"Mr. Trolley."

A lady of New York—where the horse cars are still in fashion—in speaking of the extent of the trolley systems throughout the country, said: "Mr. Trolley must be a very rich man if he is interested in so many street car lines."

There was a moment of dead silence, and then convulsions resulted as every hearer realized the sincerity and earnestness of the remark.

The laughter was taken good-naturedly and the speaker explained that "trolley" to her mind was the same as Westinghouse, Wagner and Pullman of steam railway fame.

Electric Canal Boat Propulsion.

Mr. Frank W. Hawley, vice-president of the Cataract General Electric Company, last week closed a contract for the equipment of an experimental system for canal boat propulsion, to be built somewhere along the banks of the Erie Canal. The experimental line will be four miles in length. It is to be completed within 60 days. The system to be used is described as follows:

Along each bank of the canal will be erected a pole line, the poles being made of hollow steel and set in cement, extending 16 feet above the ground and outside of the towpath. Upon the top of the poles will be placed a steel cable one and one-half inches in diameter. Fourteen inches below this cable will be a second cable one inch in diameter. From the top cable will be suspended a traveler, or car, which operates on that cable. In the traveler, or car, is a shaft around which the lower cable makes three turns, and this shaft is operated by a Tesla motor. A motorman operates the traveler in the same manner as in electric cars.

To Preserve the Privacy of the Telephone Service.

An act has been approved by the governor of New York requiring employés of telephone companies, on and after September 1 next, to be as secretive regarding the nature of their business as are the men and women who handle telegraphic messages. The act makes it punishable by a maximum fine of $1,000 or imprisonment for not more than six months, for any person to wrongfully obtain or attempt to obtain any knowledge of a telegraphic or telephonic message by connivance with a clerk, operator, messenger or other employé of a telegraph or telephone company. The same punishment may fall on the operator or other employé of the telegraph or telephone company who willfully divulges to any one but the person for whom it was intended the contents or nature of any message or dispatch intrusted to him for transmission or delivery. The same penalties attach to refusal or neglect of an employé to duly transmit or deliver such message, or the aiding or abetting of any unlawful business or traffic.

A Visit to the Hotel Champlain.

A party of distinguished newspaper men, among them some more or less well-known electrical men, visited the Hotel Champlain a few days ago and enjoyed the beautiful scenery that only the historic Lake Champlain can present. Many electrical visitors to the Montreal Electric Light Convention remember a pleasant stop at the hotel on their return. The hotel has been greatly improved, is lighted throughout with electricity, and is so admirably located as to give splendid views of the great mountains of three States. The air is so fresh and pure that, as one distinguished journalist put it, "It seemed to be laundried." Mine Host Seavey gave the guests a parting dinner, superbly decorated by his brother, the well-known artist. Messrs. Geo. H. Daniels and J. W. Burdick, of the railroads, and Mr. Seavey were voted inc mparable hosts and a happy party returned to New York city delighted and invigorated.

AN EASTERN TELEPHONE ASSOCIATION.

A COMMITTEE OF FIVE APPOINTED TO FORMULATE A PLAN—REPRESENTATIVE ATTENDANCE.

The ELECTRICAL REVIEW announced July 10 that the manufacturers of telephone apparatus in New York and New England were considering favorably the forming of an association. A meeting for this purpose was held at the Astor House Wednesday of this week and the matter discussed at length. It was finally decided to appoint a committee of five to formulate a plan of organization, and the next meeting will be called as soon as the committee is ready. There was a representative attendance of anti-Bell manufacturers of the East present, among them being the following:

A. F. Stanley, of De Veau & Company, New York.

J. D. Leatherbee, of the National Telephone Manufacturing Company, Boston.

J. H. Scofield, of Phœnix Interior Telephone Company, New York.

Geo. W. Coy, of the Franklin Telephone and Electric Company, New York.

H. C. Williamson, of the United Electric Telephone Company, New York.

A. H. Chadbourne, of the United States Telephone Construction Company, Philadelphia.

S. J. Tunbridge, of the Utica Fire Alarm Company, Utica, N. Y.

James R. Strong, of the Tucker Electrical Construction Company, New York.

H. H. Douglas, of the Century Telephone Company, Boston.

Palmer Bros., of Mianus, Conn., were represented by Mr. Palmer, and the Manhattan Electrical Supply Company, of New York, by Mr. Wetmore. Mr. H. T. Johnson, of the latter company, was unable to attend owing to the death of his father. Mr. Josiah Tice, of New Brunswick, N. J., wrote favoring the objects of the meeting, but was unable to be present.

An Electrician Fatally Shocked.

On Sunday night Charles Gruive, 30 years old, an employé of the East River Electric Light Company, received a fatal shock of electricity at the company's station in East Twenty-fourth street, New York city. He had gone to repair some wires and had been standing for several minutes near one of the great dynamos on the second floor when he was heard by a workman standing close by to utter a slight cry. He fell to the floor and the workman running immediately to him found him unconscious. Two ambulance doctors endeavored to resuscitate him, but were unable to do so. Gruive was considered a careful and clever man.

The success of a trolley party which required 61 cars to carry it has led a Philadelphia paper to designate the new fad "trolliosis."

BRUSH LOSES THE DOUBLE CARBON LAMP CASE.

UNITED STATES CIRCUIT COURT JUDGE SHOWALTER DECIDES IN FAVOR OF THE WESTERN ELECTRIC COMPANY.

The following is the decision in main in the famous double carbon arc lamp suit, which the Brush Electric Company has spent $200,000 in litigating. The Brush company has won 16 suits in various parts of the country on the patent in question. The decision does not declare the patent invalid, but says that the same results can be accomplished by other means. It was decided in the United States Circuit Court, Northern District of Illinois. Judge Showalter, who has been on the bench about three years, has shown considerable courage in deciding this suit as he has, for his opinion is directly opposed to one handed down by Judge Brown, now a Justice of the United States Supreme Court.

After describing the Brush lamp the Judge says:

The ideas of the Brush invention in suit were apparently these:

1. By separating the added pair of carbons first he threw the entire current down the other pair and thus determined that the arc should form between said other pair, or pair last separated.

2. By separating the added pair at a greater distance apart than the other pair he avoided accidental alternation in the arc between the two pairs.

3. By permanently holding the added pair in such separated relation the first pair could be fed together and consumed without stop.

In his specification Brush says:

My invention comprehends, broadly, any lamp or light regulator where m re than one set of carbons are emp oyed, wherein—say in a lamp having two sets of carbons—one set of carbons will separate the other.

Again, the operation of my device as thus far specified is as follows: When the current is not passing through the lamp, the positive and negative carbons of each set A, A′ are in actual contact. When now, a current is passed through the lamp the magnetic attraction of the helices E will operate to raise the lifter D. This lifter, operating upon the clamps C and C′, tilts them and causes them to clamp and lift the carbon holders B, B′ and thus separate the carbons and produce the voltaic arc light, but it will be especially noticed that the lifting and separation of these carbons is not simultaneous. One pair is separated before the other, it matters not how little nor how short a time before. This separation breaks the circuit at that point and the entire current is now passing through the unseparated pair of carbons A′, and now when the lifter, continuing to rise, separates these points, the voltaic arc will be established between them and the light thus produced.

As already stated, after the first pair of carbons has been consumed so that the first carbon rod holding the stump of the burned carbon ceases to feed and the added pair of carbons thereupon part and burn, the lamp of the new patent, the special features of the new invention, being now superfluous is substantially identical with the lamp of said first patent.

In the new patent, that in suit, Brush does not in the specifications describe or in the claims refer to the manner of burning the added pair as being a part of his new invention.

During the burning of the added pair the lamp has become substantially the invention protected by the said first patent.

The patentee says, further, in the specification of the patent in suit:

The lifter D, in the present instance, is so formed that when it is raised it shall not operate upon the clamps C, C′, simultaneously but shall lift first one and then the other (pref rably the clamp C first and C′ second, for reasons which will hereafter appear). This function of dissimultaneous action upon the carbons or their holders, whereby one set of carbons shall be separated in advance of the other, c nstitutes the principal and most important feature of my present invention.

In his drawings and in describing the mechanism and the action thereof of the patent in suit, Brush shows only two pairs of carbons, but in other places in his specifications and in his claims quoted below he speaks of two or more pairs of carbons. It will be seen that by affixing additional arms to the lifter D, additional clamp rings holding additional carbon rods and pairs of carbons might be operated. In such case the clamp rings would be engaged in rapid succession by the upward movement of the lifter D and the arc would form as before, between the pair of carbons last separated. So that in such case, as Brush puts it in his claims, the separations would take place "dissimultaneously or successively." The word "successively" is here synonomous with "dissimultaneously," the latter term having been coined to imply more definitely the unity of movement which characterizes the separations, whether between the members of two pairs or between the members of more pairs than two. I have said that the clutch lever D might be made to effect separations between the members of more than two pairs, but, for the purpose of thinking and reasoning about the case we do not go astray if we think of one pair to be last separated and then burned, and of one added pair to be more widely separated and thereupon maintained in such separated relation pending the burning of the other pair. The claims in controversy are as follows:

1. In an electric lamp two or more pairs or sets of carbons in combination with mechanism constructed to separate said pairs dissimultaneously or successively, substantially as and for the purpose specified.

2. In an electric lamp two or more pairs or sets of carbons in combination w th mechanism constructed to separate sa d p irs dissimultaneously or successively, and establish the electric light between the members of but one pair (to wit, the pair last separated), while the members of the remaining pair or pairs are maintained in a separate relation, substantially as shown.

3. In an electric lamp having more than one pair or set of carbons, the combination, with said carbon sets or pairs, of mechanism constructed to impart to them independent and dissimultaneous separating and feeding movements, whereby the electric light will be established between the members of but one of said pairs or sets at a time, while the members of the remaining pair or pairs are maintained in a separate relation, substantially as shown.

4. In a single electric lamp two or more pairs or sets of carbons, all placed in circuit, so that when their members are in contact the current may pass freely through all said pairs alike, in combination with mechanism constructed to separate said pairs dissimultaneously or successively, substantially as and for the purpose shown.

5. In an electric lamp wherein more than one set or pair of carbons are employed the lifter D or its equivalent, moved by any suitable means, and constructed to act upon said carbons or carbon-holders dissimultaneously or successively, substantially as and for the purpose shown.

6. In an electric lamp wherein more than one pair or set of carbons are employed, a clamp C or its equivalent, for each said pair or set, said clamps C adapted to grasp and move said carbons or carbon-holders dissimultaneously or successively, substantially as and for the purpose shown.

The observable interval between the point of time at which the separation between the added pair of carbons takes place and the point of time at which the separation of the other pair takes place, the purpose being to determine the arc between the pair last separated, is the *dissimultaneousness* found in each of said six claims.

With all respect for the learned writer of the opinion in the Toledo case and for the learned counsel for complainant, the formula of words "dissimultaneous arc-forming separation" does not carry any definite meaning. The adjectives *simultaneous* or *dissimultaneous* are words of comparison. The former means that two or more occurrences or happenings are identical in time; the latter, that they are successive—that is to say, with an interval between each two in succession. The arc-forming separation which takes place between the first pair of carbons to burn and the arc-forming separation which takes place several hours later between the added pair of carbons, are certainly successive and, loosely speaking, dissimultaneous, but these separations lack the unity or continuity of movement implied in the term *dissimultaneous* when used in this patent. As already said, Brush coined the word "dissimultaneous" to express the momentary but observable interval—the slight but noticeable non-coincidence in time—between the separation of the added pair of carbons and the separation of the other pair in a unitary and continuous movement due to mechanism as invented by him and described in the patent in suit, in contrast with an apparently simultaneous separation due to any mechanism appropriate for the latter purpose.

The patentee said further in his specification:

I do not in any degree limit myself to any specific method or mechanism for lifting, moving or separating the carbon points or their holders, so long as the peculiar functions and results hereinafter to be specified shall be accomplished.

The specification and claims were evidently prepared with the idea that *the mode of movement*, to wit, the rapid, successive and continuous separations between the pairs of carbons terminating in the arc between the pair last separated, could be secured to Brush, regardless of the mechanism by which this mode of movement should be produced. In Brush Electric Company *vs.* The Fort Wayne Electric Light Company, Judge Gresham held, answering the contention that the first, second, third and fourth claims were for functions or results and hence, void, that mechanism such as described in the drawings and specifications, or a substantial equivalent, was an essential element in each of said claims. I am not called on to determine these constructions, but the conclusion reached apparently in the Toledo case that no one of these claims contains the element of dissimultaneous or successive separations between the members of each pair of carbons for the purpose of forming the arc between the pair last separated, seems to me unsound.

The patentee says:

In the lamp as shown in the drawings the support K is in the form of a tube surrounding the carbon-holder B, and this support K is made of such a length that when the carbons A shall have been sufficiently consumed a head upon the carbon-holder B will rest upon the top of the support K, whereby the weight of the carbon-holder B and its support K shall at all times and under any circumstances be supported by the lifter D.

In other words, and without going again over the mechanism, the lamp is constructed so that the carbons A shall first burn. By reason of the support K being carried on the upper carbon-holder of the first pair of carbons to burn, and of the greater distance between the two carbons of the added pair, said added pair could not be burned first.

It is, in other words, the characteristic feature of this lamp, the very purpose signified by its construction, that the position of the first arc shall be determined before lighting, as between the two pairs of carbons.

Yet, in the opinion in the Toledo case, this is declared to be "a wholly immaterial and useless feature."

Even if it were, in fact, immaterial which pair of carbons burned first—supposing it to be true that if the carbons were separated simultaneously instead of dissimultaneously the lamp would still operate—the fact remains that the patentee took from the government claims in which the dissimultaneous separations are the special feature. Moreover, the feature of dissimultaneous arc-forming separations—referring here to the interval of hours between the arc-forming separation of the first pair to burn, and the arc-forming separation between the added pair—is not in any one of the claims. In order to make out a case of infringement, the former element must be gotten out of, and the latter must be gotten into, each claim. This in my judgment cannot be done. The lamps made under patent No. 418,758 do not contain mechanism constructed to cause the dissimultaneous initial separations of the carbons, nor do the lamps made under patent No. 502,535, nor do the lamps made under patent No. 502,536. I hold, therefore, that no infringement is made out in either suit. The order will be in each case that the bill be dismissed for want of equity.

Henry A. Seymour, Offield, Towle & Linthicum, and Wm. B. Bolton, for complainants; Barton and Brown, for defendants.

ELECTRIC LIGHT FLASHES.

Boston has 17,050 miles of underground wire, used for electrical purposes, and 28,000 horse-power is employed in the generation of electrical energy for use in that city. There are in use in Boston 220,000 incandescent lamps and 6,600 arc lamps.

The report of the Detroit, Mich., Municipal Lighting Commission shows that the lighting plant has cost $493,445.99 to date. Of that amount $81,239.76 was for towers, and $73,900.29 was expended in line construction. The completed plant will cost $630,000, but the cost per light has not yet been determined.

Judge Shirley, of Springfield, Ill., has issued a temporary writ of injunction to prevent the authorities of the city of Springfield from paying money on its contract for lighting the public streets and public buildings of the city. It was issued on a bill filed by Charles E. Hay, who is the treasurer of the Springfield Electric Light and Power Company, which sets out that the contract between the city and the defendant company was illegally entered into, and that the former is paying the latter an exorbitant price for its lights. The controversy is really between the two electric light companies. The Springfield Electric Light and Power Company had a contract with the city to do its lighting for a term of years. This contract the city council arbitrarily abrogated, and entered into another contract with the Capitol company and the litigation grows out of this fact.

OUR BOSTON LETTER.

The Beacon Lamp Company, of this city, report business as very good for this time of year. They have just secured the contract for 3,000 lamps for the new building of the American Tract Society in New York. It is particularly gratifying to them from the fact that there was the hottest kind of competition for the contract.

The latest improved sight feed oil cups, manufactured by Wm. H. Wilkinson & Company, of this city, are taking a wonderful hold among the engine builders of the country, and where they are known they are used to the exclusion of everything else. Their merits have been so thoroughly appreciated by leading contractors for the installation of power plants that they are specifying their use on the engines they put in. This means considerable for a device of this kind, but the merits of the cup warrant it.

W. B. Southgate & Company, of this city, the active young firm of manufacturers' agents, have just added another specialty to their line by securing the eastern agency for "Peerless Commutator Compound." This compound, as its name implies, is intended to prevent all sparking and cutting of commutators, and it does the work thoroughly.

The Crefeld Electrical Works have purchased the entire plant, machinery, stock and good will of the Campbell Electrical Supply Company at Watertown, Mass., from Mr. R. A. Stewart, receiver, and removed the whole outfit to Saylesville, R. I., where it has been incorporated into the Crefeld works. They will continue the manufacture and sale of the well-known "Century" line wires and weatherproof tape, which have attained so enviable a reputation in the trade during the past few years under the management of the Campbell company. The high grade of both lines of goods will be fully maintained, and their sale pushed vigorously. The former superintendent of the Campbell company's factory has been retained by the new management.

H. G. T.

Boston, July 27.

GENERAL NOTES.

It is reported that only about 3,500 shares of American Bell Telephone stock were taken under the legal subscription offering 10,000 shares at 195. None of the large holders subscribed.

An officer of the General Electric Company is quoted as saying that, in his belief, the Manhattan elevated railway contract for electrical equipment will not be decided this year. He looks for the installation of an experimental plant on a portion of one of the lines as a move preparatory to the general adoption of electricity.

Ever since the organization of the Georgia Electric Light Company, of Atlanta, Ga., it has wired residences, stores, offices, etc., preparatory to the use of electricity for lights and power. The company now announces that it will abandon this work and in future confine itself strictly to the business of furnishing light and power to consumers.

SECONDARY ELECTROLYSIS.

BY E. ANDREOLI.

By means of porous partitions (BB′, Fig. 1) divide a vat into three compartments. Pour into the central and the two side compartments electrolytic solutions. Finally, place into C′ an anode, E, and into C a cathode, F. As soon as a current is passed from E to F, the electrolytes in CC′ are decomposed just as if there were no central compartment in the vat; in fact, the solution in the central compartment shows no trace whatsoever of electrolysis. But as soon as we insert into D (Fig. 2) one, or rather several, metallic plates, GG, etc., chemical activity is at once noticeable, which, as I believe, is attributable to an indirect or "secondary electrolytic" action. In spite of exhaustive research, I do not find that this fact has ever been discussed in electro-chemical text-books, and I think I am the first one who has mentioned this phenomenon, and shown a method of utilizing the secondary electrolytical action.

To show what happens between the partitions which separate the several solutions, I shall cite a few of the phenomena I have observed in the central compartment of the vat.

Fill the right and left compartments with a solution of salt, and pour into the central one a strong or diluted solution of cyanide of gold. Use a plate of carbon for the positive electrode and a plate of iron for the cathode. As soon as an electric current is passed through the vat electrolytic decomposition sets in, chlorine being formed at the positive pole, E, and caustic soda at the negative pole, F, while no change is observable as regards the cyanide of gold solution in D. Placing now a metallic plate, or rather several plates, GGG, into the central compartment, the plates being not connected with either the cathode or anode, gold is deposited upon them. Neither the chlorine in C′ nor the caustic soda in C contaminates the gold solution in D. In accordance with current density and the number of plates, the gold deposition takes place more or less rapidly. The face or section of the solution which is in contact with the partition of the negative compartment becomes positive. This is proved in the following manner: Replace the partition with a sheet of lead; it will quickly be peroxidized on the outside, gold being deposited on its inner side. Horizontal or vertical metallic plates, placed in the section of the liquid near the positive compartment, become negative and are likewise coated with gold.

Evidently then some pronounced chemical action occurs in the central compartment and I shall proceed now to show how this phenomenon may be produced or avoided. I shall restrict myself here to electrolytic deposition by the immersion of metallic sheets into various electrolytes.

In the following experiment I replace the saline solution in C C′ with cyanide of gold, it being exactly the same solution which I have employed before. In this case I use lead for the anode and an iron sheet for the cathode. After several days I removed 100 cubic centimetres from compartments C C′. After evaporation of

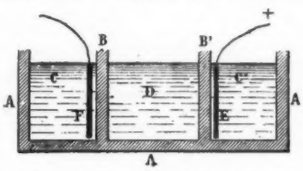
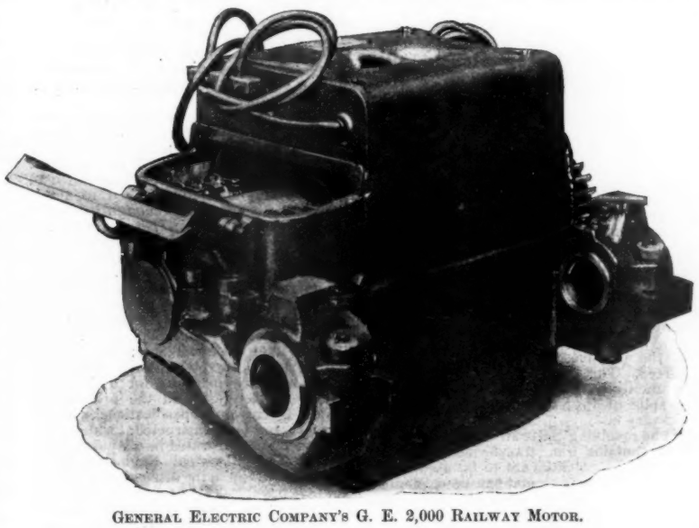


FIG. 1.—SECONDARY ELECTROLYSIS.

the liquid, scorification and cupellation of the remainder, I found that the quantity of gold obtained therefrom was exactly the same as that contained in the original solution. Not a trace of gold could be detected on the negative plate. Consequently, no such electrolytic action as is known in galvano-plastic operations had happened either at the positive or negative pole. At the same time I could dilute the gold solution in the central compartment to 100 liters.

A practical utilization of secondary electrolysis consists in transforming sodium bisulphite into the hydrosulphite. As a rule, electrolysis of sulphur compounds is impracticable, yet through the action of the secondary electrolysis, which is both a rapid and simple process, the bisulphite changes into hydrosulphite without necessitating us to concentrate the solution to 35 or 40 Baume. And, again, the nature of the solutions in the side compartments is of little importance in this process. It is advisable to employ good conducting liquids, and none which require special electrodes. The method of electrolytically decomposing bisulphite of sodium is rather interesting. From a special vessel the solution is permitted to enter the central compartment, D. In the absence of metallic plates no electrolytic effect takes place, but on plunging two or more plates into it, chemical action sets in promptly with the evolution of gas. The solution thus acquires its bleaching property, and, if we now draw the chlorinated solution from the central compartment into a vessel containing wool, the latter is quickly bleached. If the solution is partially or totally exhausted, we can regenerate the liquid in the central compartment and repeat this process a great many times until it will be necessary to add fresh bisulphite.

Our present text-books state that in an electrolyte the current travels between the two poles in an uninterrupted chain of molecules; also that any metallic plate placed between an anode and cathode becomes positive on the side opposite the negative pole and *vice-versa*; but it is evident that as, in accordance with the intervening distance, the resistance increases, there must be a point where this effect is nil. Again, in the transmission of current between two poles, separated by plates, there is but one liquid. I have stated before that secondary electrolysis must not be confounded with direct electrolysis.



GENERAL ELECTRIC COMPANY'S G. E. 2,000 RAILWAY MOTOR.

In fact, we deal here with a new phenomenon whose existence has been denied by many savants, *i. e.*, the reciprocal transfer of ions from one compartment to another through an electrolyte which itself remains inert, becoming neither acid nor alkaline. To change this electrolyte into an active liquid it suffices to place metallic plates or grids into the central compartment and it will be

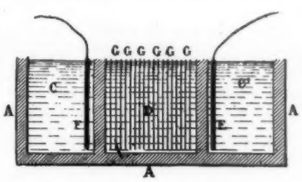


FIG. 2.—SECONDARY ELECTROLYSIS.

found that they act immediately as a negative electrode to the positive side of the compartment, reducing metals, etc.

I do not desire to enlarge upon the commercial utilization of secondary electrolysis. At present, I merely propose to describe an hitherto unknown phenomenon, a new electrolytic process. It appears that the principal difference between primary and secondary electrolysis consists in the fact that the deposition does not take place upon the electrode of the compartment containing the cathode; on the contrary, the deposit is invariably formed upon the metallic plates in the central compartment which holds the gold or silver solution, either in a saturated or diluted state.

London, July 5, 1895.

"G. E. 2,000" Railway Motor.

The adaptation of electricity to elevated and steam railway traction and the increase in suburban traffic have necessitated the use of motors of a heavier and more powerful type than those ordinarily used in street railway service. To meet the demand created by this need, the General Electric Company has recently designed and put out two sizes, known, respectively, as the G. E. 1,200 and G. E. 2,000. These have already been long enough in service to show that they meet the requirements of the heavier service in a most satisfactory manner.

The G. E. 2,000, shown in the illustration herewith, is designed for a draw-bar pull of 2,000 pounds when mounted on 33-inch wheels (hence its appellation). Complete with gear case, it measures only 50 inches in width, and is therefore adapted to use on standard gauge axles. For its power, its weight is comparatively light, viz., 430 pounds. The armature is of the "barrel" type, a method of construction which allows of the ready repair of a damaged conductor. The ironclad construction of the armature, so conspicuously successful in the well-known G. E. 800, is followed in the G. E. 2,000.

The G. E. 2,000 motor is now operating successfully the cars of the Metropolitan West Side Road recently opened to the public in Chicago. It will also be used upon the cars which are to run on the Nantasket Beach division of the N. Y., N. H. & H. R. R., which is in course of equipment for electric operation. The G. E. 2,000 finds a field also in the driving of heavy mining machinery, and numerous hoists and pumps scattered throughout the country are being operated by G. E. 2,000 motors.

The G. E. 1,200 is built upon the same general lines as the G. E. 800 with such modifications introduced as to give it a more powerful tractive effort. As in the case of the G. E. 800 and the G. E. 2,000, it is classified by the tractive power exerted, the numeral representing the number of pounds draw-bar pull with the motor mounted on 33-inch wheels. The G. E. 1,200 is especially adapted to the needs of heavy suburban traffic and to such duties as cannot conveniently be met by the G. E. 800.

With these three G. E. motors, 800, 1,200 and 2,000, the General Electric Company is now in a position to supply efficient and practical motors of any output needed for the requirements of light or heavy power of railway service.

DISTINGUISHED SCIENTISTS IN ACRID DISCUSSION.

PROFESSORS ROWLAND AND FORBES WRITE ABOUT THE NIAGARA QUESTION.

In the ELECTRICAL REVIEW for March 20, 1895, page 147, appeared an abstract of an interview from London *Lightning*, entitled "Prof. George Forbes on Niagara and Its Critics." The issue of our London contemporary for July 11, 1895, under the heading "Niagara," contains this paragraph as a sub-head:

We have no desire to be the medium for further discussion upon matters which have caused differences between those who have taken part in the work at Niagara, but we publish Professor Rowland's letter, as it has direct reference to paragraphs which appeared in *Lightning*. We have thought it right to publish Professor Forbes' reply at the same time.

Then comes Professor Rowland's letter, which is as follows:

In your paper of some time ago you publish an interview with Prof. George Forbes, which contains remarks about my connection with the Cataract Construction Company so far from the truth that I cannot allow them to pass without comment.

In making this statement I am, of course, hampered by the necessity of only mentioning those facts which have, in various ways, become public property.

My first report was made to the company in 1889, not 1890, as Professor Forbes states. In this report the questions submitted to me were very limited. Suffice it to say I did not report against the alternating current system; I said it had a "great future before it," but at that time it was not in a commercial state; and, indeed, neither was the continuous current system for such an enterprise. I advised the company to wait and study the problem for a time. This I regard even now as most excellent advice.

If Professor Forbes, more than a year later, was able to report definitely in favor of the alternating current system, I am not surprised, after the immense strides made in the subject during the interval between our reports.

When called upon again, in the Summer of 1892, I found that the company was ready to decide upon their final plans, and that they wished my opinion principally upon the scheme devised by Professor Forbes himself.

Believing that I could readily agree with a gentleman who had examined all the systems of the world, I consented, thinking it all mere form.

When, however, I came to examine the plans I found that I could not agree, and I would have gained peace and freedom from the most disagreeable experience of my life if I had done so. But I regarded it as cowardly to withdraw, and as I had agreed to give my opinion, I did so in words scientifically true and exact.

It is not to be supposed that I went into this enterprise as an electrical engineer to give advice on details, but only as an electrical expert to decide on the general system to be used and the company to carry it out. The Cataract company knew that there were many, including Professor Forbes, who were more familiar with details, but they wished me to study the subject from a general standpoint and give them my judgment on it.

The main subject that I had to consider was Professor Forbes' report to the company, dated September 16, 1892, giving his final recommendations to the company.

As this report was handed to me confidentially, I only feel at liberty to quote the final specifications, as these have been made public by the action of the company in sending them to those who were to bid on the plant, as well as in other ways.

Each dynamo is of such size that it absorbs 5,000 horse-power of mechanical energy on the shaft. It is to be supported on a vertical shaft working in adjustable bearings; speed, 250 revolutions per minute.

The revolving parts of the dynamo must weigh not over 10 tons, and must be perfectly balanced. The top bearing must be supported in a thoroughly substantial manner. The dynamo is to generate alternating current with eight and one-third complete periods per second. The armature coils to consist of eight coils, four in what we may call phase A and four in phase B, which is in quadrative with phase A. The four coils in either of these circuits can be connected in series or parallel, or two in series and two in parallel, thus giving at will either 2,500, 5,000 or 10,000 volts.

The armature must have no revolving iron. The conductors revolving between pole faces are to be vertical and are to be driven and supported by driving pieces rigidly connected with the shaft, and so designed that Foucault currents do not unduly heat them. The losses due to copper resistance, Foucault currents and hysteresis are not to exceed two per cent of the maximum output. Rises in temperature of the armature conductors not to exceed 30 degrees Fahrenheit. Insulation throughout to be of mica and must be subjected through mechanical strain or changes of temperature to no shearing stress.

These recommendations can be analyzed as follows:

1. The two-phase alternating system was to be used.
2. Very light revolving parts, not exceeding 10 tons in weight, to be used.
3. No iron to be used in armatures, but only bare revolving copper bars.
4. No transformers to be used at the dynamo, but 10,000 volts to be obtained direct from the dynamo.
5. A period of eight and one-third per second.

These specifications were accompanied by a design embodying them in a concrete form, and showing that the copper bars were parallel to the axis.

With the exception of the first recommendation to use the two-phase system, I condemned the whole scheme, and said that a dynamo built after Professor Forbes' drawing would not last a month, if it did a week.

The tremendous racking stress on each coil at the low period of eight and one-third, the coil being of copper bars, parallel to the axis, without iron around it, all at a potential of 10,000 volts, was certainly sufficient to make me use very strong language.

Again, the light revolving parts would cause such an unsteady motion that I recommended them to be of larger diameter and to weigh not less than 25 tons.

The system at Niagara to-day does not contain a single feature that I condemned. The whole of what Professor Forbes intended as his final report has been swept away. One feature alone remains, the use of the two-phase system, and to this I agreed. The system that I recommended is practically that in use at Niagara to day, in spite of Professor Forbes' opposition to the very last.

The revolving parts are heavy, the armature contains iron, transformers to obtain the highest potential are to be used, and a period of 25 per second has been adopted. The exact figures, however, have been somewhat altered. My "not less than 25 tons" for the revolving parts has become 40 tons, and my period of 42 or 33 has gone down to 25, and my revolving armature has become revolving magnets. As to whether the changes are for the better, only time can show. Whether 40 tons can be successfully revolved at 250 turns per minute, a short time will decide.

As to the charge of Professor Forbes, that I won my suit for the reason that the company had ordered my services though they did not act on my advice, the above is sufficient answer. I am perfectly satisfied with the extent to which the company profited by my advice.

But I have one word more to say, and that is with regard to the reason of my bringing a suit against the Cataract Construction Company for so paltry a thing as a bill.

Everybody who is acquainted with me at all knows that money forms a very small portion among the objects that I seek. But when men wish me to take my mind from those objects which I love, and to devote it to their money-making pursuits, I am then entitled to be compensated at the same rate as a first-class lawyer or physician.

Furthermore, I have no right to degrade the profession of a man of science by undervaluing my services.

Let everybody recognize that the successful pursuit of science requires quite as much brains and knowledge as that of law, and that a scientific error often equals in disastrous consequences a legal error.

HENRY A. ROWLAND,
Johns Hopkins University, Balt more, Md.

Professor Forbes' reply is as follows:

The above letter requires refutation on two points: 1, that Professor Rowland had anything to do with the plans adopted for Niagara. 2, that the extract from one of my confidential reports is the specification which I sent out to manufacturers to bid upon.

I.—PROFESSOR ROWLAND'S CLAIMS.

1. The officials of the Niagara company have informed me and others that he was employed only to get him to withdraw his opposition to alternating currents. To do this they gave him one (and only one) of my reports to them which delt with this point, and they got me and others to instruct him. At our first meeting he stated *ex cathedrâ* that the Tesla motor was of no use; but cross-examination proved that he did not understand the principle of its action. Seven months of instruction reversed this decision.

2. So useless was his report to the company that it was not shown to me until I had completed all my plans and decided on the dynamo design.

3. His report did nothing except to recommend the dynamo proposed by a certain firm, to whom, at the same time, he was trying to sell some patents for transformers. This dynamo was totally unsuitable.

4. His pitiable lawsuit showed, by the evidence of the company's officials, that he had nothing to do with the plans for our work, and that the directors relied entirely upon the advice and inventive capacity of their electrical consulting engineer.

II.—MY SPECIFICATION FOR A DYNAMO.

1. The quotation in Professor Rowland's letter is not the specification I sent to manufacturers. This accounts for much of his misunderstanding. That specification filled 12 pages of printed foolscap, was accompanied by 12 sheets of drawings, and was never shown to Professor Rowland. My paper in 1893 to the Institute of Electrical Engineers contains an abstract.

2. The report of 36 pages which he read says at the end that it is not a final report; but it is a very good general account of the plans we have adopted. It is absurd to say I opposed what we have done. As the consulting engineer, I originated it and carried it all through.

3. What he quotes as my specification was a suggestion I made when a separate fly-wheel was thought necessary, as this was the only type (like the Siemens or Ferranti) which could possibly bring the weight down to what we were absolutely limited to, and if it could be made strong enough it was the best type electrically. That suggestion of a specification was guarded by the prefatory words, "if a thoroughly good machine, electrically and mechanically, can be designed on these principles, it ought to comply with the following specification." From designs I worked at it seemed possible, but I was not over sanguine, and I had not then hit upon the novel design of alternator with external revolving field, which did away with the necessity for a fly-wheel, which completely solved the problem, of which I sent out specifications which I caused to be constructed, which was described and illustrated in my paper to the Institute of Electrical Engineers, about which Mr. Kapp in the discussion said it was the best possible design for the purpose, and for which the company formally thanked me in writing as having saved them from a most awkward dilemma. I could not, however, with this design use so low a frequency as I desired.

I could say a great deal more, but do not wish to take up more of your valuable space. I wish it to be known, however, that Professor Rowland's misconceptions are largely due to the fact that we did not think it necessary or advisable to inform him of what we were doing.

GEORGE FORBES,
34 Great George St., Westminster, July 9, '95.

Johns Hopkins University's Electrical Course.

The programme of instruction in the course of applied electricity at Johns Hopkins University, Baltimore, Md., has been issued and may be had on application. The course extends over two years and is intended principally for graduate students. It includes lectures on theoretical and applied electricity and electrical measurements, with so much of mechanical engineering as seems necessary. An important feature is laboratory work, to which much attention is paid, and original investigation is especially encouraged. The instruction is given by H. A. Rowland, professor of physics; Louis Duncan, associate professor of electricity; Hermann S. Hering, associate in electricity; and H. G. Geer, instructor in mechanical engineering.

ELECTRIC RAILWAY NOTES.

A recent investigation of the operations of the Twin City Rapid Transit Company, of St. Paul and Minneapolis, showed the operating cost per car mile to be as low as nine cents.

The Galveston, Texas, City Railroad Company has increased the wages of all employés 10 per cent from July 1. The receipts of the company have increased 15 per cent.

The Worcester, Mass., Traction Company has declared a dividend of three per cent on the preferred stock, payable August 1. Books closed on July 20 and will reopen August 1.

The Binghamton, N. Y., Railroad Company, of which G. Tracy Rogers is president, makes the following showing for the year ended June 30, 1895: Receipts, $127,483.61; operating expenses, $73,716.48; taxes, $3,247.40; net earnings from operation, $50,519.73. Binghamton and suburbs have a population of about 50,000.

The company which is to connect Hartford, Conn., with New Britain by trolley is the Newington Tramway Company. The road will be built under a charter granted in 1893, which would have expired on June 29 last. On June 28 the company accepted its charter. It is claimed that the new road will not parallel either the New York & New England or the Consolidated roads.

The Lowell & Suburban Street Railway Company appeared before the Massachusetts railroad commissioners on July 22 and petitioned for approval of issue of $400,000 stock for reconstruction and equipment with electricity. The Board will hear the report in September on the new park to be maintained by the railway company near Tyngsboro, Mass., and render its decision.

President Judge Thayer of the Common Pleas Court, Philadelphia, on July 25 handed down a decision in the equity proceedings of the city against the Commissioners of Fairmount Park and the Fairmount Park Transportation Company dismissing the bill filed by the city and directing that the municipality pay the costs. The bill was brought to prevent the construction of a trolley road in Fairmount Park, and Judge Thayer's decision has the effect of permitting the construction of the road.

The decision of the General Term of the Supreme Court in the appeal from the judgment of Justice Walter Lloyd Smith, setting aside the franchise of the Nassau Electric and Kings County Electric Railroad Companies, generally known as the Flynn roads, was handed down in Brooklyn, N. Y., on July 26. It upsets Justice Smith's decision, and upholds the contentions of the companies on all the points raised in the protracted litigation. The privilege of operating nearly 50 miles of trolley lines within the boundaries of Brooklyn and the little town of Flatlands, which now embrace the entire territory of Kings county, was involved.

CENTRAL STATION ECONOMICS.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, CHICAGO, JULY 17, 1895, BY J. S. STEPHENS.

My subject is so broad, covering as it does practically the whole field of conversion of heat energy to mechanical, mechanical to electric energy, and the many-sided question of its economical distribution, rounding up with the nearly always uncertain questions of really how much per commercial unit of value the electricity has cost and why it has cost so much at the point of delivery to the consumer, that I can only touch lightly upon some few of the many questions that are worthy of consideration.

To speak of location of an electric light or power plant as belonging to central station economics will appear to some as foreign to the subject, yet the installation of many plants without due consideration given to this matter of proper location has, I believe, had as much to do with the failure of many investments of this sort to furnish satisfactory returns as many other matters that are usually looked upon as of greater importance, and I believe each year will bring with it some stronger practical argument in support of this view.

We have now to consider relative location of plant to centers of distribution, proximity to water and fuel supply, cost of property and possibilities of future combinations of light and power supply; use of exhaust steam for heating in Winter and in southern sections the feasibility of combining a refrigerating plant with the electric lighting or power installation. In many cases a possible combination of factory power, either electrical or direct-driven, has been entirely overlooked. All of these have a proportionate and determinable value. I have not undertaken to enumerate them relative to their value, from the fact that different conditions due to different locations will vary the relative value. This much I would advise: Do not slight this question of location; it truly belongs to the economical operation of your plant and may often prove the prime factor in success or failure of an electrical venture. Employ a reliable, experienced, practical engineer and employ him early—before you decide on where your plant shall be located. Have him determine a value for the governing conditions in your case and acting on this information you will, at least, have to your credit an advantageous position.

I do not think I am far wrong in saying that in the inception and installation of the majority of smaller sized electric light and power plants, the one item, usually of minor importance, cost per square foot of land, has been the controlling factor. This for the same reason that too often holds good throughout in the practical handling of the economics of a central station, the financial control being in the hands of those who know 99 cents from a dollar. And as electricity is an imponderable quantity, which they believe and which too often has an uncertain value, they jog along on the 99 cent basis fearful of their own ignorance of thermodyanics, dynamics and electrical generation and distribution, frankly believing that all these are uncertain, unknowable qualities and that the dollar and cents basis pure and simple is all-sufficient.

The plan and construction of a building to contain an electric light or power plant should be governed by the reasons already mentioned. In reference to location: The question of adaptability to increase of power, the question of rates of insurance and possibility of permanent, simple construction, that is perfectly adapted to the work, and practically fireproof, have not always had due consideration.

This matter of a suitable building is of great importance. There are too many fire traps covering costly machinery; hot, and dirty because hot engine and dynamo rooms, electric light and power stations that consist of an aggregation of pitch roof, French roof and flat-roof shacks whose number and date of construction can only be guessed at by the different angles of roof on the outside and color of interior sheathing. And the other extreme, though not so common, of building brick chimneys in themselves good but in the cases in mind unsuited to conditions, the greater proportion of a capital upon which the business in view would pay interest being sunk in these permanent investments to the exclusion of purchase of economical machinery and intelligent service. Both of these extremes are too well known to be in evidence to require further illustration.

For a growing district, build with a view to future enlargement. Don't build a fire trap; the difference in insurance will pay the interest on a properly designed fire-proof building, even for a small station. Don't forget that electrical machinery, like a great many other things unnecessary to mention, will keep best in a dry, cool place, and that such a place means a saving of dollars in proportion of power required to collection for service rendered.

The choice of suitable steam power machinery, or provision for the first transformation in the series between the coal pile and the lamp or power at the other end of the line, is in importance proportionate to cost of fuel, and yet what may be the very best engine and boiler and detailed arrangement of steam power for an ordinary manufacturing plant, is not always best for an electric light and power station in the same locality and same cost for fuel. A simplicity of detail, proportion of parts and permanency of construction that will give continuous reliable service is pre-eminently necessary to obtain satisfactory results.

With the really small differences in cost per horse-power between suitable boiler capacity at a safe working pressure of 140 pounds with compound engines, and the ordinary working pressure of 80 to 100 pounds used in the smaller plants with single cylinder engines, the cost of coal would usually have to be less than $1 per ton, where it would not pay to use the compound engine and higher steam pressure. In deciding upon boilers and engines, too much dependence should not be placed in the usual guarantees of efficiency. Such guarantees are useless unless some pre-arranged plan be provided to determine their fulfillment, and better still, some penalty and premium proportional to the value of difference in economy. Such a plan, however, is usually impracticable, and the question can be best decided only by a thorough knowledge of the requirements of the case and the many styles of boilers and engines that are offered, and good judgment governed by practical experience.

You cannot get the best or most suitable engine and boiler pump or heater by considering proposals from all comers and purchasing at the lowest price, and on the other side there are both boilers and engines on the market at the present time obtaining a large share of patronage, the commercial success of which is due mostly to the ignorance of the purchaser regarding these matters. In the installation of your plant keep the main issue, the most light and power attainable for the least cost, clearly in view. There are more stations running at the present time that are losing more money from improper proportion of parts, design of steam connections, unnecessary shafting, bearings and belting friction and preventable electrical losses than all the money that can be shown on the credit side.

The relative efficiency of the different designs of electrical machinery and adaptability to any particular service is mainly a question of local conditions. The varying range of efficiency as compared with the steam power end of the plant is small and, while the direct-connected dynamo and engine will always make the best mechanical construction, I am not convinced that saving due to this method of driving will always pay interest on the actual difference in cost.

Further discussion of this and the pro and con of direct and alternating current I, perhaps, had better leave to the representatives of the different companies who manufacture these different classes of machine. They are always able to decide on this important matter and it is not very hard, usually, to predetermine which way each will advise.

Even though all other details of installation and management of a central station be about right, the one item of distribution may, and has, I believe, proved a stumbling block to success in some instances. Careless proportion of wire to service required, bad joints and poor insulation are enemies of economy that may be found in too many plants at the present time. I have in mind several instances that have come within my experience lately that I trust may act as warning lights to others. Within a week's time, the weather being rainy and windy, while visiting a central station furnishing hundreds of arc lights, I saw complete circuits cut out on account of grounds three different times and four or five men turned out in the rain to trace the circuit and find the ground, and in each case, after hours of search, it was found on the roof of some building, the last time within 100 feet of the station. The wiring had been done, shall I say, in an economical (?) way.

I have in mind two electric railway plants, one in the eastern and one in the western section of the United States. The managers of both were taking especial pains to see that the voltage at power station should not go above 500 as marked on the generators. Five hundred voltmeters were in use, and I know for a fact that the average working volts at the motors varied from 400 to 450. You can draw your own conclusions. Within the year (on a small alternating plant installed by one of the leading companies) I have had taken out 15 converters, ranging from five to 15 lights, all within a distance of not over 400 feet, aggregating 130 lights capacity. A single 75-light converter now furnishes the same service at a large saving in both first cost and loss of current. Proper regard for all of the matters so far mentioned will not bring full measure of success without the assistance and service of brains—reliable and industrious help. I have heard a friend of mine, president of one of the large lighting companies, remark that his superintendent's head was not the right shape. I am not sure that he should blame the superintendent for this. Really good men cannot be retained for the wages that every Tom, Dick or Harry that comes along may be willing to work for, and a good man can usually save his salary if given a fair opportunity. Don't make machines out of your men. The interests are too variable for this to prove successful. Put some responsibility on them. Make them feel an interest in the results, and better still, if you have a proper system of operating your business, you can provide for a premium plan on operation that will actually give the men an interest and at the same time tend greatly to your own benefit in the economical operation of your station.

A thorough systematic method of records of service, including boilers, engines, dynamos and circuit losses, with properly tabulated monthly deductions or averages, along with a suitably classified system of accounts, will, I believe, do more to get things moving in the right direction than anything else.

The all too common way of bunching the expenditures and simply trying to keep them within the available amount received from collections may save bookkeeping, but I believe it wastes an opportunity that might be made available to save some money and at the same time provide a means of comparison, if some standard system were used whereby better average results might be obtained.

On the mechanical or operating side such records of fuel, steam pressure, horse-power, electrical output of stations and current furnished to consumers, could be simply and easily kept, and properly tabulated would be of great value. Would it not be a move in the right direction for this association to take the initiative in this matter and formulate some system of record that can be easily kept and used for mutual improvement? I can understand that some will object to the bookkeeping end of their business being interfered with, but I can see no reason why some systematic record of at least the proportion and value of fuel used to electrical output of station, and proportion of station output to that furnished to consumers, should not be made for mutual benefit. With a record for one year of these items alone, from the stations here represented, a foundation would be laid that I feel confident would be built upon, and the data so obtained would certainly be of great value to this association and to the different central stations, by providing a reliable working basis for improvements tending to the more economical production of electric light and power.

LONG-DISTANCE TRANSMISSION AT TEN THOUSAND VOLTS—THE POMONA PLANT.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NIAGARA FALLS, N. Y., JUNE 27, 1895, BY GEORGE HERBERT WINSLOW.

(*Concluded from page 55.*)

Some curious conditions met with in the operation of the plant are shown in the ampere curves in Fig. 6, which were taken during very wet weather. Taking the maximum load measurements at 7 P. M. for March 14 and 8, we note that the total apparent energy delivered by the sub-stations is 73 per cent and 75 per cent, respectively, of that delivered by the generator, while for a smaller load at 9 P. M. the respective percentages decrease to 47.6 per cent and 48.6 per cent in spite of the fact that the apparent energy delivered by the generator is in the latter case only half as great as in the former. The results are due to changes in the angle of lag caused by changing the load.

In the canon curve of March 8 the load at 9.30 P. M is seen to have increased considerably, although the sub-station loads were decreasing. This increase was due to the fact that the rain, which had previously ceased to fall at Pomona, began again.

The electrical resistance of the Pomona circuit is 74.9 ohms and that of San Bernardino 156.4 ohms at about 90 degrees Fahrenheit.

The insulation resistance of the circuits varies from far beyond the limits of an 11-megohm bridge in dry, hot Summer weather to as low as 0.65 megohm during light rain. The latter value is that obtained with the two San Bernardino wires in series and represents an insulation resistance per mile of over 37 megohms. On a clear, sunny day the insulation resistances of one Pomona wire and of one San Bernardino wire were, respectively, 11 megohms and five and one-half megohms, which are in the exact relation which would be expected.

The lines cannot be tested for grounds or for continuity with a magneto bell, as their capacity is such that the bell will ring loudly when the wire is perfectly insulated and the circuit open. This capacity also prevents the use of the ordinary converter test for line leakage, as the lamp on the secondary will burn as though there were a ground even when the line is perfectly clear. By adding lamps, however, the light may be cut down until the last lamp added extinguishes them all. This would not occur if the light of the first lamp was due to a difference of potential on the primary caused by a ground, as then the added lamps would become as bright as the first. The primary current is thus seen to be limited and to be due to the capacity of the line. If the proper number of lamps has been added to just secure darkness when the line is known to be free from grounds the converter may be used to show grounds on that line, since the presence of a ground will cause all the lamps to brighten. The line test should only be made after ascertaining with one lamp that the generator is not grounded, as otherwise the leakage current for the greater number of lamps might burn the insulation of the generator. A very good example of Professor Fleming's "condenser effect" was met with in the Summer of 1893, while the engineer was trying this converter test for measuring line leakage. The primary of a thousand 100-volt converter was connected between the ground and one terminal of the generator, the other terminal of the latter being connected to one wire of the Pomona circuit. The resulting secondary pressure was 30 volts, which made one lamp burn dimly. When 10 lamps were turned on the pressure dropped to 14 volts. When all lamps were turned off the pressure became 10 times as great, or 140 volts. One generator brush was then raised and the second leg of the circuit was connected to the first. On completing the circuit again there was a sudden flash of the armature, followed by a crackling noise and a brush discharge which lasted until the circuit was broken. The Pomona wires were then disconnected from the dynamo terminal, which was left free. With this arrangement faint sparks and a glow were noticed, as though the armature winding were grounded on the core, but a Wheatstone bridge test showed an insulation resistance of over 10 megohms. Since then the machine has been used regularly and has not broken down, so it is evident the spark must have resulted from a sudden increase of the potential of the armature winding above that of its core, which latter was permanently connected to earth.

This sudden increase may be explained as follows: On closing the circuit the condenser formed by the line and the earth began to discharge through the metallic circuit afforded by the armature and converter windings, but the inductance of this circuit checked the discharge so quickly as to produce an excessive pressure which could only be relieved by the discharge taking place through the insulation of the armature winding to the grounded core, which is what happened.

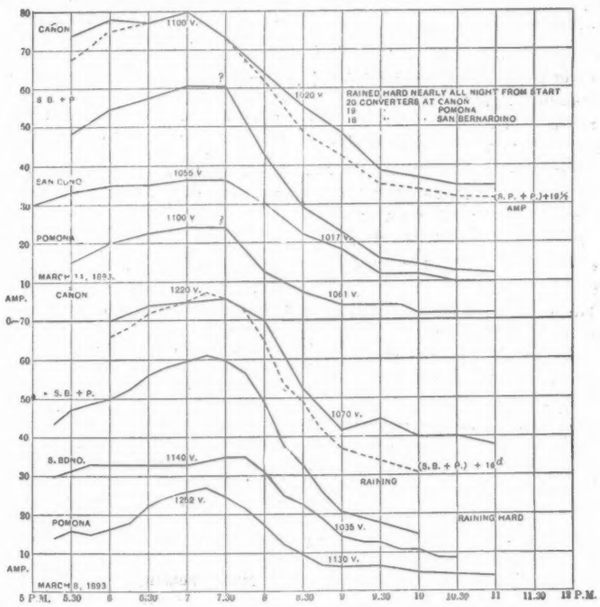


FIG. 6.—Ampere Curves. Showing Excess of Canon Load and also Decrease in Difference between Canon Load and the sum of Pomona and San Bernardino Loads as the Canon Load Increases.

Note increase due to rain. Raining in afternoon and nearly all night at Pomona. Snowing throughout canon and a mile or so outside of mouth of canon. Eight inches of snow at power house, covering insulators and cross-arms completely. One inch of snow on wires. Snow damp and clinging. No wind. Twenty conductors at canon, 19 at Pomona and San Bernardino. 12 P. M.

A similar test was made on the San Bernardino wires in the previous January during dry weather, the only change being that the single lamp was not turned off. With only one wire connected, one 16 candle-power lamp came nearly to candle-power. On connecting the second wire to the first (at San B.) the lamp burned at full candle-power. Ten lamps (the full load) were then put on the converter and burned dimly. As they were turned off one by one the others brightened, until the last lamp lighted up as before. This test did not cause any discharge on the armature, in spite of the fact that the circuit was twice as long and the capacity thus twice as great. The probable explanation of this is that the inductive resistance of the converter was not so great as in the other case, on account of the single lamp being left burning. It is also possible that the breakdown in the other test was assisted by the presence of copper dust on the winding.

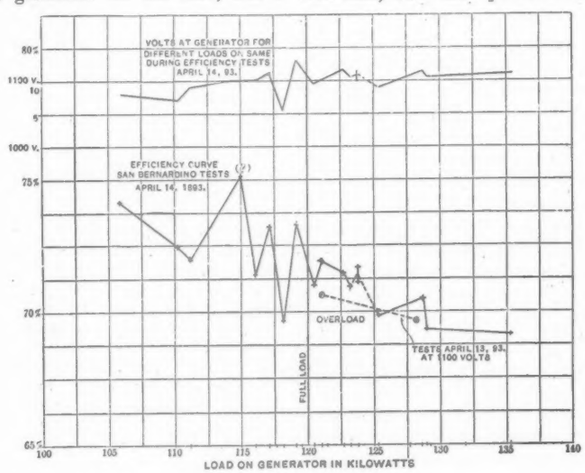

VOLTS AT GENERATOR FOR DIFFERENT LOADS ON SAME DURING EFFICIENCY TESTS APRIL 14, 93.
1100 V.
1000 V.
EFFICIENCY CURVE SAN BERNARDINO TESTS APRIL 14, 1893.
OVER-LOAD
FULL LOAD
TESTS APRIL 13, 93. AT 1100 VOLTS
100 105 110 115 120 125 130 135 140
LOAD ON GENERATOR IN KILOWATTS

FIG. 7.

A comparison of the San Bernardino switchboard voltmeter was made with a Weston instrument and gave important results.

1. With no load the San Bernardino instrument was about 14 volts (11.2 per cent) low at 125 volts, while at 97 volts it was only 11.7 volts (12 per cent) low.

2. With a city load (inductive, consisting of lightly loaded converters) of 7½ amperes it was 11 volts low between 107 and 96 volts, while for 15 amperes it was only 8.5 volts low. Further increase in load caused further reduction in the difference, until for 40 amperes the instrument was only five volts low.

3. With a tank load (non-inductive) of nine amperes it was only nine volts low at 99 volts, and as the load was increased the difference decreased, until for 97 amperes the instrument read the same as the Weston.

It is evident from these observations that a voltmeter which consists essentially of a solenoid and a movable core is not the proper type of instrument for circuits such as those used in the present case, in which transmission circuits of great length are used in conjunction with transformers. The voltage at San Bernardino during the tests was, therefore, measured with a Weston portable voltmeter.

A comparison between the ammeters used at Pomona and San Bernardino showed that for readings above 67½ amperes the San Bernardino instrument read higher than the other. As there was no reason for considering one instrument more accurate than the other and no way of telling which was right, the San Bernardino readings taken during the test were reduced to the average of simultaneous readings on the two instruments.

A short test of the Pomona circuit was made on April 11.

A preliminary efficiency test on the San Bernardino circuit was made April 13, 1893, with the results shown in curve in Fig. 7. In this, as in all the other tests, a variable load was obtained by the use of a water resistance.

An efficiency test of the San Bernardino circuit lasting five hours, during which the generator was kept at full load or over-load, was made April 14, 1893. Readings were taken every 15 minutes, and the efficiencies and the corresponding voltages for different loads are plotted in Fig. 7. The most prominent feature of this efficiency curve is its irregularity. This is, however, satisfactorily explained by referring to the curve of generator voltage, on which it is seen that the high efficiencies correspond to high voltages and *vice versa*.

It will be noted that the apparent efficiencies shown by the preliminary test at San Bernardino agree very closely with the results of the long efficiency test there. On calculating the apparent efficiencies for different loads from data obtained by laboratory tests and comparing them with the measured apparent efficiencies, it is found that they agree within three or four per cent. This very close agreement is exceedingly gratifying, particularly when we consider that the tests of the plant were made with ordinary commercial instruments and that the laboratory tests were made about a year before the commercial tests.

An interesting and unique test was made May 2, 1893, by connecting the Pomona line wires in series with the San Bernardino circuit and transmitting about 100 horse-power to San Bernardino by way of Pomona. The length of the circuit was 85 miles and

the distance of transmission 42½ miles. This is the greatest distance yet covered by any transmission since the Frankfort experiments.

The apparent efficiencies are much lower than those indicated by calculations, as in the latter no account was taken of the capacity and inductance of the circuit. The voltage of the generator, as measured, is about five per cent above that calculated, and the amperes measured notably exceed the amperes calculated. These results are attributable to the introduction of the Pomona loop, which added both capacity and inductance.

In order to reduce the cost of operation, the San Antonio company first dispensed with the sub-station attendant at Pomona after 11 P. M. This they did sometime before the acceptance of the plant, after assuming the responsibility for any damage which might result. No trouble occurred and, after the acceptance, May 6, 1893, the same plan was put in operation at San Bernardino. After working in this way for several months the Pomona station was started in the afternoon and then locked up until the next morning. This arrangement was made possible by running the generator so that the lights should not be too high at Pomona, the lights at San Bernandino being kept right by the attendant with the Stillwell regulator.

In January, 1894, another 120-kilowatt generator was installed with an equal capacity of oil transformers, and the Pomona and San Bernardino circuits are now each operated from separate generators with separate banks of transformers of 10,000 volts. Since this change the San Bernardino attendant has also been dispensed with, and the bookkeeper starts up in the afternoon and then locks up the station for the night, as at Pomona. The voltage of the lamps on each circuit is regulated by the engineer at the power house, the generator pressure necessary at different loads to keep the lamps at the proper brilliancy being automatically indicated by the compensating voltmeter on each circuit. Thus, after the plant is started the engineer has sole charge.

KIND WORDS.

DOESN'T WANT TO MISS A SINGLE NUMBER.

To the Editor of Electrical Review:

Please change my address to Mansfield, Ohio. I do not want to miss a single number of the Electrical Review. It is the finest paper for any mechanical or other trade-working people to read and study. You can learn more in one year from this paper than you can in double that time in any text-book.

Yours truly, D. C.

Mansfield, O., July 24.

"STYLE AND REAL VALUE."

To the Editor of Electrical Review:

The Electrical Review grows better with each number. You are certainly to be complimented on the style and real value of your paper.

Yours truly, M. D.

Sandusky, O., July 23.

Electric Gas Lighting.

To the Editor of Electrical Review:

I would be very much obliged to you if you would send me the names and addresses of several reliable electric gas lighting firms.

I am, very truly yours,

W. H. Lansing.

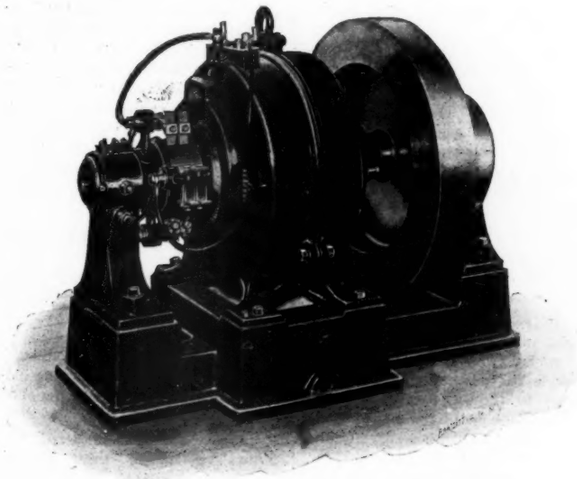
17 Prospect street, Gloversville, N. Y., July 23.

The Standard Electric Company's Arc Lamp.

Probably no exhibit at the Northwestern Electrical Convention in Chicago attracted more attention than the new arc lamp recently placed on the market by the Standard Electric Company, of Chicago, and of which more than 1,000 are now in use. In exterior appearance it is similar to the former type of Standard lamp, but when the cover is lowered the marked simplicity of the mechanism is apparent. As this lamp is a prime favorite with Mr. Perry, it was perfectly natural that he should find pleasure in debating on its good qualities; how the potential of the arc remained just the same regardless of the position of the clutch, the lamp magnets always being in perfect electrical balance; how an instantaneous and silent arc was always assured; how the present arrangement of the magnets does away with the necessity of perfect cleanliness to insure economical and satisfactory service. It is claimed that the potential of the arc never rises above 50 volts or drops below 46, and though the amperes should vary from 5 to 15, still the arc will form silently and instantaneously at the normal voltage and so remain. As the contact points in the automatic cut-out are of platinum there can be no corrosion and the lamp cuts out without a spark. For conducting the current to the carbon rod there is a substantial brush capable of carrying more than 20 amperes. The brush is so arranged that the friction upon the rod is reduced to a minimum. For outdoor service each lamp is provided with a double pole weatherproof switch, which is enclosed in a compact "detachable cap" and is so constructed as to permit the lamp being instantly removed from the line without opening or breaking the circuit.

Lundell Generators for Gas Engine Service.

The Interior Conduit and Insulation Company, of New York city, have made several modifications in the well-known Lundell generator manufactured by them, which adapt it for use in isolated lighting when the motive power is furnished by a gas engine. Great improvements have been made in the last few years in gas engines, but up to this date no gas engine above five horse-power has been available, it is said, that could be relied upon to operate at uniform speed. In order to provide for absolutely uniform electro-motive force, the Interior Conduit and Insulation Company have built a special generator, illustrated herewith, which carries, in addition to the belt pulley, a fly-wheel of heavy rim weight. In this fly-wheel is stored up sufficient energy to compensate for the slight inherent irregularities in the speed of the gas engine. Extra care has been taken in furnishing substantial pedestals, heavy shaft and modern self-aligning and self-oiling bearings. The efficiency of the dynamos is from 86 per cent for the small machines to 95 per cent for the largest machines.



Lundell Generator Arranged for Gas Engine Service.

Our Resuscitation Leaflets Are In Good Hands.

To the Editor of Electrical Review:

We acknowledge receipt of package of "Instructions for Resuscitation of Persons Suffering from Accidental Shock by Electricity." These have been handed to the various physicians in this place and in the adjacent cities of Rock Island and Davenport. We have also tacked them up in conspicuous places at our station and several offices, and have recommended their particular study by our employés, believing that an acquaintance with these remedies and methods might sometime be the means of saving human life.

Three linemen have been killed in the neighboring city of Davenport by electric shock within the last two months. While death, in each of the cases, was instantaneous, the occurrences cannot fail to impress upon one the value of a knowledge of simple and efficacious remedies, which may be easily and promptly applied by ordinary persons of non-technical education, such as are most likely to be in the vicinity of an accident and in a position to render instant aid.

Thanking you for the favor, we remain, Yours very truly,

People's Power Company,
S. S. Davis, Secretary.

Moline, Ill., July 22, 1895.

Use the brush that gives the best results at least cost.

EXCELSIOR BRUSH.

THE EXCELSIOR T.H.SYSTEM

Cheapest brush on the market, quality considered. Made of special tempered copper. Write for prices.

NICHOLAS ZOCC,
732 East 143d Street, N. Y. CITY.

NOTICE.

Bardstown, Ky., will receive bids for installation of Electric Lighting Plant until August 10, 1895. Specifications furnished upon application.

WEATHER-PROOF TRADE MARK "O.K." LINE AND HOUSE WIRES

AGENCIES:

ELECTRIC APPLIANCE CO., CHICAGO, ILL.
PETTINGELL-ANDREWS CO., BOSTON, MASS.
ELECTRICAL ENGINEERING CO. MINNEAPOLIS, MINN.
ST. LOUIS ELECT'L SUPPLY CO., ST. LOUIS, MO.
BRADFORD BELTING CO., CINCINNATI, O.

PHILLIPS INSULATED WIRE CO.,

NEW YORK OFFICE: 39 & 41 Cortlandt Street. FACTORY: PAWTUCKET, R. I.

FIRE.

The destruction of our Works by fire on April 7th was almost complete.
We have already resumed manufacturing and are making limited shipments, which are daily increasing.
Send us your orders. We will fill them with reasonable despatch, or advise you promptly if we cannot.

CROCKER-WHEELER ELECTRIC COMPANY,

Manufacturers and Electrical Engineers.
New York. Chicago. Boston. Philadelphia.
Sizes up to 250 H. P.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Telephone and Telegraph Companies.

YARMOUTH, ME.—Yarmouth Telephone Company has been organized for the purpose of manufacturing and dealing in electrical goods, etc. Capital stock, $10,000. President, John Coombs of Yarmouth; treasurer, A. H. Coombs of Yarmouth.

MILBRIDGE, ME.—A new telephone line is being constructed between this place and Machias. Mr. Ackley Brag has charge of the work for the New England Telephone Company.

PARIS, KY.—The Paris Telephone Company has been granted a franchise in Carlisle and the right of way from Paris to Maysville over the Maysville and Lexington turnpike.

EVERETT, MASS.—A new telephone company will soon be organized here with prominent citizens as backers.

IRON RIVER, WIS.—Articles of incorporation have been filed for the Iron River Electric Light and Telephone Company. The incorporators are Warner S. Carr, Byron Ripley and O. H. Campbell, and the capital stock is $20,000.

SUMMIT, N. J.—The Standard Telephone Company is making efforts to place a general telephone system here.

BAY CITY, WIS.—A plan is on foot looking to the organization of a new telephone company composed of people residing in the valley cities, Saginaw, Bay City and West Bay City.

LOGANSPORT, IND.—A franchise has been granted to construct a new telephone system here. The new plant will be in operation by October 1.

JASPER, IND.—The Jasper County Telephone Company has been incorporated with a capital stock of $8,000. Incorporators: James T. Watson, C. C. Sigler, E. L. Hollings and Delos Thompson, all of Rensselaer, and the system will include Jasper, Newton, Benton, Porter, Lake, White, Pulaski, Starke, Laporte and Tippecanoe counties.

MIDDLETOWN, N. Y.—The Sullivan County Telephone Company has about 75 telephones in operation on its lines. The system is now being extended to Callicoon depot by way of North Branch and Hortonville.

Electric Light and Power.

CLINTON, IA.—Electric lights are to be established here.

MASON, MICH.—The citizens of this place have voted to buy the electric light plant for $7,000 owned by Paddock & Henderson.

NEW LONDON, CONN.—The Oneco Company is about to set up two compound engines for the electric light business of an aggregate of 600 horse-power.

KALAMAZOO, MICH.—The city electric light plant will be sold on a $36,000 mortgage.

ST. IGNACE, MICH.—An electric light plant is to be established here.

ADRIAN, MICH.—Mayor Kirkpatrick advised negotiations looking toward the purchase by the city of the electric lighting plant of Captain J. H. Fee & Son.

STEPHENVILLE, TEX.—James Beech will put in an electric light plant.

MADISONVILLE, KY.—I. Bradley can give information concerning contemplated electric light plant.

GEORGETOWN, S. C.—W. E. Suddon, of Florence, S. C., has been granted franchise for electric light plant, and will erect same.

BROOKHAVEN, MISS. — The Brookhaven Manufacturing and Improvement Company has been granted franchise to erect electric light plant.

BOLIVAR, MO.—The Mayor can give information concerning the issuance of $8,500 bonds for the erection of electric light plant.

LAMPASAS, TEX.—The Lampasas Electric Light Company has been incorporated by J. T. Donovan, E. A. Maxwell, W. L. Donovan and others. Capital stock, $10,000.

MEXIA, TEX.—Mexia Lighting and Power Company has been incorporated by William L. Hall and John W. Shoaf. Capital stock, $15,000.

PORTLAND, CONN.—The Portland Light and Power Company has been incorporated by E. F. Bigelow, A. H. Hale, E. I. Bell, F. De Peyster, J. H. Peyton and others.

SAN JOSE, CAL.—The Mercantile Gas and Electric Company has been incorporated by J. B. Klernana and F. C. Randall. Capital stock, $500,000.

KLAMATH FALLS, ORE.—Klamath Falls Light and Water Company has been incorporated by Charles S. Moore, George T. Baldwin and Harry V. Gates, to furnish electric light and power, telephone service and water for the town of Klamath Falls. Capital stock, $2,000.

MENDOTA, ILL.—Mendota Light and Heat Company has been incorporated by John Goedtner, Anton Kuelgen, G. H. Madden, Newton Imus and T. C. Schultz. Capital stock, $2,000.

ATHENS, GA.—The Athens Gas Light Company has made a proposition to the City Council to sell its electric light plant to the city. A municipal election will probably be held to vote upon this matter.

COLUMBUS, OHIO.—The Arcade Mutual Electric Light Company has been incorporated by Oliver E. Connor, Louis H. E Hummel, F. Seibert and M. L. Robertson. Capital stock, $50,000.

PATERSON, N. J.—The Edison Electric Illuminating Company, reported to have recorded real estate mortage for $600,000.

ATCHISON, KAS.—Atchison Railway, Light and Power Company, reported to have recorded chattel mortgage for $150,000.

GARDNER, MASS.—The Gardner Electric Light Company has just contracted with the Fitchburg Steam Engine Company for a 250 horse-power compound engine, with a maximum capacity of 350 horse-power.

SAN JOSE. CAL.—Metropolitan Gas and Electric Light Company has been incorporated. Principal place of business, San Jose. Capital stock, $500,000. Directors: J. V. McKiernan, Frank Whitaker, E C. Randall, W. W. Wood, C. K. Fleming, San Jose.

CRESTON, IA.—It is rumored that a new electric light plant is to be started here.

MOHAWK, N. Y.—David Cronin, of this place, is building a 1,000 electric light plant for McKinnon's mill at Little Falls. He is also building a plant for the Saxony mill.

SANDY HILL, N. Y.—The Sandy Hill Power Company has extended its business so as to include the manufacture of paper and wood pulp. The amount of its capital stock is $100,000.

UNIONVILLE, CONN.—A generator weighing 10 tons and of 160 horse-power is being placed in position in the Preston mill, near the Suburban grounds. It will furnish power for the arc and incandescent lights in the grove.

ASTORIA, ILL.—An electric light plant will probably be established. Winter Scripps will let contract for electric light plant, for which he recently secured franchise.

OWENSBORO, KY.—Philip R. Zulauf, city clerk, can give information concerning construction of electric light plant, to cost from $22,000 to $25,000.

HUMBOLDT, TENN.—Bonds have been issued for the construction of an electric light plant.

AUSTIN, TEX.—The city will issue $200,000 worth of bonds to complete its waterworks and electric light plant.

CHATTANOOGA, TENN.—The Chattanooga Light and Power Company will build a new $50,000 plant.

GENEVA, OHIO.—A new electric lighting company has been formed at this place. The incorporators are Messrs. J. A. Carter, Charles Munger, Charles and Albert Chamberlain and Lucian Seymours. The concern starts with an authorized capital stock of $12,000. The object is to furnish light for the cycle plant.

SEARCY, TEX.—The Searcy Electric Light and Power Company has dissolved.

New Electric Railways.

ASBURY PARK, N. J.—The Atlantic Coast Railway Company will get a franchise to run a trolley line through Long Branch.

WORCESTER, MASS.—The stockholders of the North End Street Railway Company voted to withdraw the old issue of bonds, $55,000, and to issue $75,000 worth.

ROCKLAND, ME.—The Rockland, Thomaston and Camden Electric Railway will extend at once their line to Tillsons wharf.

KANE, PA.—A street railway is to be built here. A company has been organized and a charter applied for.

WILKESBARRE, PA.—An electric road is being built from this place to Harvey's Lake.

SCRANTON, PA.—The Scranton Traction Company is extending its Taylor line to Rendham.

BALTIMORE, MD.—A contract for the construction of the Catonsville electric line of the city and suburban railway system has been awarded to Jones, Pollock & Co.

ELGIN, ILL.—Dundee Rapid Transit Company has changed its name to Elgin Electric Illuminating Company.

GRAFTON, W. VA.—The electric street railway has again been revived and talk is now freely indulged in of work commencing in a few days.

LUZERNE, PA.—Reese D. Isaac, of Dallas, has secured the contract for building the power house of the Luzerne, Dallas & Harvey's Lake Railway Company.

SYRACUSE, N. Y.—Contracts have been let for the construction of the Grace and Madison street division of the Syracuse street railway system to Belden and Seeley. About $150,000 is estimated as the cost of building these two lines.

KANSAS CITY, MO.—The Kansas City Elevated Railway Company, Robert Gilham, manager, will build an elevated viaduct 614 feet long, for an electric and cable road, to cost $40,000.

FAIRFIELD, KY.—E. H. Bridwell is interested in the proposed electric road from Louisville to Fairfield. About $20,000 worth of stock has already been subscribed.

HOT SPRINGS, ARK.—A company is being formed to build an electric road from Hot Springs to the Ouachita River.

BASIC CITY, VA.—A company will probably be formed to build an electric railroad from Basic City to Bridgewater, Va.

WORCESTER, MASS.—The Blackstone Valley Street Railway Company has been organized by F. A. Lapham, of Worcester; J. H. Furguson, of Milbury; E. E. Howe, of Grafton, and others. Capital stock, $100,000.

CONSHOHOCKEN, PA.—It is rumored that the Philadelphia Traction Company has offered to purchase the entire trolley outfits of the Schuylkill Valley Traction Company and the Norristown and Chestnut Hill Passenger Railway Company.

VERSAILLES, PA.—The Versailles Traction Company has decided to build a power house.

ZANESVILLE, OHIO.—Ex-Auditor Patterson, A. W. Evans and L. W. Doane, of this city, have presented a petition to the county commissioners for a right of way to construct an electric car line on the national pike west from this city to the county limits.

GLOVERSVILLE, N. Y.—The directors of the Gloversville Electric Company have awarded contracts for a 180 horse-power engine and one electric dynamo of 175 horse-power to the Westinghouse Electric Company.

PARSONS, KAS.—The Kansas & Missouri Electric Railway Company is the name of a new organization. Capital stock, $25,000. Directors: Sam. Barrett, Robert Robyn, A. L. Chaplin, of Pittsburgh, Kas.; Robert Simons, of Westchester, Pa.; L. M. Bedell, Carl J. Simons and Harry W. Bedell, of Chetopa.

DES MOINES, IOWA.—The street car company announces that next year it will extend its Ninth street car line into Crocker Woods Park.

MONTAGUE, MASS.—It is expected that now an electric road for two miles will be built from Lake Pleasant to this place by the Pierce Construction Company.

FT. MADISON, IOWA.—The mule car line will be changed to an electric street railway. The motor to be used is the Westinghouse single reduction.

SCHENECTADY, N. Y.—The General Electric Company has been awarded the contract for furnishing the motors for the Lake Street Elevated Railway, a new Chicago line.

DERRY, N. H.—The electric road from this place to Chester, it is believed, will be built in the near future. The cost will not exceed $50,000.

ALEXANDRIA, VA.—The Washington, Alexandria & Mount Vernon is to be extended from Arlington to Waterloo, and material is being purchased for that purpose. D. W. Holden is superintendent, and can give particulars.

MILFORD, MASS.—C. B. Powers, of South Framington, is interested in the construction of the Milford-Holliston electric line, and can furnish information regarding same.

CHICAGO, ILL.—The Transcontinental Railway Company has been incorporated, to construct and operate an electric railway from Chicago to Jersey city. Capital stock, $200,000,000.

OCALA, FLA.—Mayor T. G. Reardon is interested in an electric line which will probably be built by the Merchants' Union to Silver Springs.

BIRMINGHAM, ALA.—The Birmingham Railway and Electric Company has begun the work of rebuilding its lines for electric motors. The East Lake road will be the first to be changed.

PITTSBURGH, PA.—The Fort Pitt Traction Company has been incorporated by Joshua Rhodes and William B. Rhodes, of Allegheny; C. L. Magee and Robert S. Frazier, of Pittsburgh, and William C. O'Reilly, of Crafton. Capital stock, $500,000.

MIDDLEBURG, OHIO.—The Gauga Central Transit Company has been incorporated by P. W. Parmele, G. H. Ford, W. S. Williams, P. T. Thompson, and E. H. Yeuman, to build an electric road from Middleburg to Russell Township. Capital stock, $10,000.

HARTFORD, CONN.—That New Britain and Hartford are to be connected by a trolley